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SUGAR BULLETIN No. 1.

FIELD EXPERIMENTS WITH SUGAR CANE, 1931-1932.

BY

C. HOLMAN B. WILLIAMS,
Sugar Cane Agronomist,

AND

R. R. FOLLETT-SMITH,
Chemist Ecologist.

WITH

AN INTRODUCTORY NOTE.

BY

PROFESSOR J. SYDNEY DASH,
Director of Agriculture.

THE "DAILY CHRONICLE," GEORGETOWN, DEMERARA,
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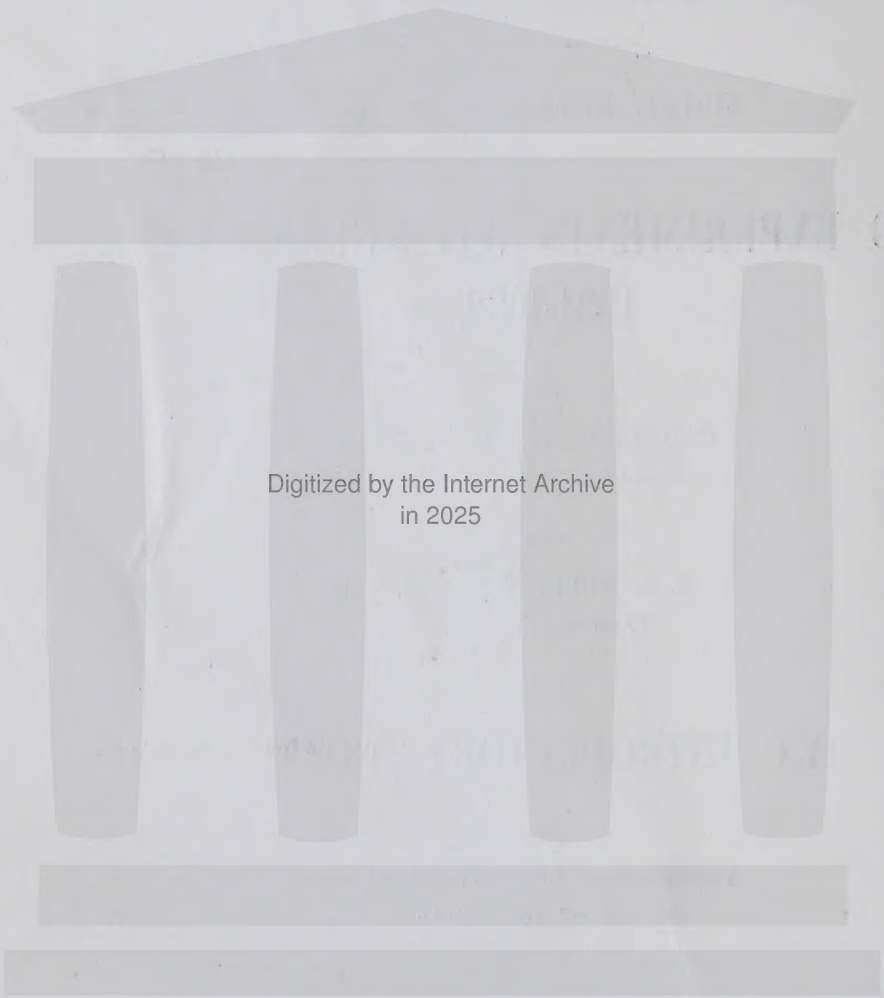

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[1] Acted for Mr. Bee during his absence from the Colony.

Note:—The cost of publishing this Bulletin has been met by a vote from the funds of the Sugar Experiment Stations' Committee.

LIST OF STAFF

Collaborating in the Execution of the Experiments herein Recorded.

ADMINISTRATION.

J. Sydney Dash, B.S.A., ...	Director of Agriculture.
F. Burnett, M.C., M.A., ...	Deputy Director of Agriculture.

SUGAR EXPERIMENT STATIONS.

C. Holman B. Williams, Dip. Agr. (I.C.T.A.),	Cane Agronomist.
C. Cameron, ...	Field Manager.
J. Singh, Dip. Agr. (I.C.T.A.), ...	,, Assistant.
L. A. Forte, ...	,, ,,
B. A. MacArthur, ...	,, ,,
L. A. Robinson, ...	Laboratory Assistant.
B. Singh, ...	,, ,,
J. B. Bourne, ...	Clerical Assistant.

DEPARTMENT OF AGRICULTURE.

R. R. Follett-Smith, B.Sc., A.R.C.S., ...	Chemist Ecologist.
C. L. C. Bourne, ...	Assistant Chemist.
H. Macluskie, U.D.A.,[1]	Agricultural Superintendent.
J. D. Gillespie, B.Sc.,[2]	,, ,,
E. M. Morgan,[1]	,, Instructor.
H. B. France,[1]	,, Assistant.

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[1] In connection with experiments at Blairmont and Port Mourant.

[2] In connection with experiments at Uitvlugt.

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INTRODUCTORY NOTE.

Reference to the recent Administrative Reports of the Department of Agriculture of British Guiana will show that the reorganisation of the Department, which had its beginnings in 1927—1928, brought within its purview the Sugar Experiment Station, Sophia, which had been created in 1919, and operated by funds contributed by the sugar planters. The whole position in respect to the work of this Station in relation to the Department of Agriculture was reviewed by the writer and proposals put forward whereby the execution of the work and the control of the staff were brought directly under the Director of Agriculture, in association with a representative committee of the sugar industry. This arrangement has permitted the fullest possible collaboration between the officers of the Department and the staff of the Station, and has allowed for a fairly comprehensive programme of research work on varieties, soils and manures to be conceived and started. In 1929 the field staff was strengthened by the appointment of a Sugar Cane Agronomist whose salary is contributed to the Treasury from Station funds. From then onwards, it has been possible to envisage the adoption of a programme which had, as one of its principal objects, the additional co-operation of the sugar estates and their staffs. Progress in that direction has been steady and definite, as the investigations described in this bulletin will show. Indeed, it is an outstanding example of co-operative effort between officers of a Government Department on the one hand, and the administrative and field forces of a major industry on the other.

It is hardly necessary to stress the need for adequate experimentation in any sphere of agricultural endeavour. Fortunately, the sugar interests in the Colony fully appreciate this and recognise the need for careful execution of the work and cautious interpretation of the results obtained. The agriculturist depends for his living on a highly complicated crop-climate-soil relationship, each part being subject to endless variation within itself and to numberless reactions among the other components of the system. This only goes to emphasise the need for closest co-operation possible between the specialist officer and the practical agriculturist, the duty of the latter being to co-operate by pooling experience, giving suggestions a fair trial, assisting in experiments and offering helpful and constructive criticism. It is felt that these objects have been achieved, in a very great measure, in the sugar experimental work in this Colony. There is need, however, for still further strengthening and increasing the stability of the foundations which have been firmly laid.

The history of agricultural production during the past forty years offers numberless examples of greater output per acre being obtained by substituting one crop variety for another. It also affords many instances of varieties suddenly or gradually failing, or "running out." Sugar-cane is no exception to the rule, and British Guiana has, itself, had the experience of the decline of the Bourbon

variety. With a view to finding, if possible, a better cane than the one now generally grown in the Colony and, at any rate, of having at hand a suitable substitute, experiments are being conducted all over the sugar area. The results obtained from twenty-one such experiments are herein reported.

As with varieties, so with manures, and, the world over, scientists and wide-awake farmers are searching for new methods which will increase their yields and which will meet the changes that have taken place in their soils, the altered market conditions for their crops, the fluctuations in fertiliser prices. Certain experiments on manures are in progress throughout our sugar region and results from nine of them are recorded here.

In connection with cultural practices there is an endless theme for variation and experiment, with only time and facilities as limiting factors. In a colony where the major portion of the cane soils are heavy clays lying below sea level and almost entirely lacking in natural drainage, it is only to be expected that some attention should be given to the removal of excess soil moisture. Six experiments on this subject are described. The results clearly indicate the great importance of subsoil drainage and the advisability of a careful study of methods for achieving this in estate practice.

This is the first of a series of bulletins which may be expected to appear periodically, since results are now beginning to accumulate sufficiently to justify publications of this nature. Results from earlier experiments laid down in the initial stages of the reorganisation period may be found in the *Agricultural Journal of British Guiana*, Vol. IV, Nos. 1, 2 and 4—a limited number of copies being still available.

The execution of such a large number of experiments, involving as it does the establishment and reaping during the period under review of over 2,000 individual plots, the accurate weighing in the field with portable balances of 3,000 tons of cane, the crushing and analysis of 1,300 cane samples aggregating 40 tons in weight, the collection and analysis of several hundred soil samples, the computation of masses of figures, is no small undertaking. It involves the expenditure of fairly considerable sums of money and the pooling of resources from Colonial Government (mostly salaries of Agricultural Department officers and laboratory expenses), from the cess which sugar planters voluntarily levy on themselves for the upkeep of the Sugar Experiment Station and from grants which the Empire Marketing Board has made for special field investigations.

No finality has been reached ; none could be in two seasons' work with a crop which takes 12—16 months to ripen and which ratoons for several years. Some very interesting and encouraging data have been obtained and light thrown on a number of questions, thus clearing the road to further progress. That the work is appreciated is evidenced by the assistance officers receive on the sugar estates where experiments are executed, the reception given to suggestions and the readi-

ness with which they are tried, the increasing monetary contributions made, not only directly to the Station's funds but through the financing of a soil survey of over half the cane area of the Colony by Messrs. Booker Bros., McConnell & Co., Ltd., the financing of a new and comprehensive series of fertiliser trials by the same concern jointly with Imperial Chemical Industries, Ltd., and by the contribution from the Empire Marketing Board. Incidentally, too, the Station houses the Entomologist investigating the sugar-cane moth-borer. The appointment of this officer was made possible by a grant from the Colonial Development Fund; he, too, has a large number of co-operative experiments on sugar estates and has also been able to obtain a considerable amount of data from the experiments described in this bulletin.

In regard to the variety work, it will be seen that a gradual and cautious extension of Diamond 10 and P.O.J. 2878 is recommended although there are several other canes which have topped D. 625, the standard cane, in one or more experiments. These latter, however, will require more testing. In the earlier variety trials reported after the reorganisation of the cane research work, practically no cane except Diamond 10 proved to be markedly better than D. 625, but in these later trials there are several new canes which have led it by wide margins in different experiments. This is very encouraging and almost more than might have been anticipated. They will be tested further at different points and for several seasons. Cane breeding and testing is a slow process and outstanding canes only appear at very rare intervals. This has been the experience even of large Stations, *e.g.*, Pasoeroean, Java, which produces 800,000 seedlings each year, and Coimbatore, India, with 200,000, as compared with the maximum of 10,000 annually in this Colony.

It may be of interest to note that at the present time, D. 625, a comparatively old variety, bred in 1892, still occupies 90 per cent. of the area devoted to cane cultivation and continues, in most cases, to give satisfactory yields—indeed, on an upward rather than downward trend. It is significant that both yield per acre and total output of sugar in the Colony have increased in recent years. There are indications, however, that no one variety can be regarded, in future, as likely to be generally suited to the whole Colony. Changes in soil conditions, as evidenced by recent soil surveys, definitely negative this probability and the results of the experiments to-date tend to substantiate that view. Similar conclusions can be drawn from the results of the manurial experiments, namely, that no one general formula is going to be an economic one for the Colony as a whole.

All experiments are supported by the necessary data regarding types of soil, rainfall and the various factors which influence ultimate crop yield: weight of cane, percentage of sucrose in cane and juice purity. Attention is drawn to the fact that the soil of each experimental site—variety or manurial—has been adequately described by laboratory examination, a feature frequently lacking in experimental work of this nature.

While many agriculturists are inclined to think only in terms of new varieties—the variety question is undoubtedly of the utmost importance and there is no suggestion of relaxed efforts in this direction—insufficient attention is often paid to the increased benefits which are possible from correct fertiliser practice. In this Colony, soil surveys, which have now become an important part of the work in relation to field experiments and manurial treatment, clearly show the need for greater study of this aspect of cane production. Some planters recognise its importance, others not to the same extent, and there is need for further extension of experiments with manures, considering the variation in cane soils met with even on individual estates.

The compilers have not overburdened the report with attempts to demonstrate a certain proficiency in well-known methods of statistical analysis, and the absence of this feature will be appreciated by those who have to apply in practice the suggestions contained in this bulletin. Likewise, no attempt has been made to calculate results in terms of monetary gains, as prices of material and costs of labour vary, but the information supplied should enable the planter to make his own calculations and draw his own conclusions in this regard. Further, it will be observed that the yields at the Central Station, Sophia, are, generally speaking, lower than on the estates, due to the lack of facilities for flood-fallowing of thrown out fields—an important factor in improving soil fertility in this Colony.

I commend the bulletin to the serious consideration of the sugar producers whose co-operation throughout is greatly appreciated. As already stated, it is only possible to give indications at this stage and to put forward suggestions rather than draw definite conclusions. The latter will assuredly evolve as more information is secured over the whole cycle of plants and ratoons which these experiments are intended to embrace.

J. SYDNEY DASH,

Director of Agriculture.

FIELD EXPERIMENTS WITH SUGAR CANE

BY

C. HOLMAN B. WILLIAMS,
Cane Agronomist,

AND

R. R. FOLLETT-SMITH,
Chemist Ecologist.

INTRODUCTION.

This Bulletin reports the results of field experiments with sugar cane reaped towards the end of 1931 and during the year 1932. The various sections and the number of trials considered in each are :—

Variety experiments	... ...	21
Manurial „	... ...	9
Drainage „	... ...	6
		36

The treatments in each experiment were replicated from four to twelve times and all the trials were laid out in Randomised Blocks or Latin Squares to enable the results to be treated statistically according to Fisher's analysis of variance.

The individual plots were usually 60 ft. long by 37 ft. wide. On their long sides they were separated from each other by the open drains, 2 to 3 ft. wide and 3 ft. deep, commonly used in local estate practice and on their narrow sides by a buffer area which was discarded at the time of reaping. In the case of variety trials the two halves of the buffer area were planted to the variety in the contiguous respective plots. Similarly in the manurial plots the treatment of any given plot was also given to half the buffer area separating it from the next plot. At reaping 0.05 acre of cane from each plot was cut and accurately weighed in the field on portable scales and a sample of cane taken for crushing and analysis. All the samples were crushed and analysed at the Sophia Station within 28 hours of harvest. Accurately weighed samples were passed through two power-driven mills having a combined extraction of 60-70% by weight, and the juice weighed and analysed. The bagasse, after thorough disintegration in a Wiley mill, was also analysed. It has thus been possible to present the results in the form of tons sucrose in cane per acre ; from this figure the yield of commercial sugar obtainable at any particular factory can be easily calculated.

VARIETY TRIALS.

SOPHIA EXPERIMENT STATION.

The following trials have been reaped :—

TABLE I.—VARIETY TRIALS REAPED AT SOPHIA EXPERIMENT STATION.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of		Type of Layout
			Planting or Previous Reaping	Reaping	Treatments	Replicates	
4 East	Plants	15.0	27.VIII.31	28.XI.32	10	7	Randomised Blocks
5 „	„	15.0	12.VI.31	13.IX.32	10	7	„ „
6 „	„	15.0	5.VI.31	9.IX.32	5	7	„ „
8 „	„	13.0	13.IV.31	19.V.32	10	7	„ „
9 „	„	13.0	8.IV.31	12.V.32	10	7	„ „
10 „	„	13.5	15.I.31	4.III.32	10	5	„ „
13 „	1st Ratoons	11.75	30.IX.31	21.IX.32	10	5	„ „
14 „	Plants	14.0	26.IX.31	22.XI.32	6	6	Latin Square
13 West	2nd Ratoons	11.75	19.IX.31	8.IX.32	10	10	Randomised Blocks
17 „	1st „	11.5	22.IX.31	8.IX.32	5	5	Latin Square

Table II below gives, in comparative columns, the monthly rainfall at the Experiment Station for the period January 1931 to November 1932, and the average monthly fall over an 11-year period. The total rainfall received by each experiment and that which might have been expected are also stated.

Table II.—Rainfall at Sophia Experiment Station.

Month.	Rainfall 1931—1932, Inches.	Average Rainfall 1921—1931, Inches.	Comparison of Actual Fall during Growth of the Various Experiments and the Average.											
			Field 4 East		Fields 5 & 6 East		Fields 8 & 9 East		Field 10 East		Field 13 East		Fields 13 & 17 West	
			Actual Fall	Average Fall	Actual Fall	Average Fall	Actual Fall	Average Fall	Actual Fall	Average Fall	Actual Fall	Average Fall	Actual Fall	Average Fall
January, 1931 ...	2.13	7.11												
February „ ...	3.58	3.75												
March „ ...	2.17	3.73												
April „ ...	1.23	4.12												
May „ ...	11.66	11.67												
June „ ...	12.59	14.65												
July „ ...	12.76	11.14												
August „ ...	6.97	8.36												
September „ ...	3.06	3.07												
October „ ...	6.68	3.92												
November „ ...	1.87	6.25												
December „ ...	8.99	14.25												
January, 1932 ...	8.92	7.11							83.73	102.88				
February „ ...	1.12	3.75												
March „ ...	6.57	3.73												
April „ ...	15.31	4.12												
May „ ...	13.33	11.67					111.06	107.81						
June „ ...	14.94	14.65												
July „ ...	7.10	11.14											94.73	92.02
August „ ...	6.84	8.36												
September „ ...	.45	3.07			127.50	129.24					92.12	92.02		
October „ ...	3.89	3.92												
November „ ...	.09	6.25	99.16	105.26										

It will be seen from the above that the rainfall on Field 4 East was 6 ins. below normal. On the whole, however the distribution was satisfactory with dry spells in November 1931 and February, September and November 1932. October, March and April 1932 were wetter than usual, especially the last named.

The total rainfall received by Fields 5 and 6 East was only 2 inches under normal. It is probable that November 1931 and February 1932 were somewhat too dry, whereas April 1932 was too wet.

Fields 8 and 9 East received just slightly more than the total amount of rain which might, from the average, have been expected ; April and November 1931 being drier, and October 1931 and April 1932 being wetter than normal.

Field 10 East received about 19 inches less rainfall than the average, having passed through a particularly droughty period during its first four months of growth when the rainfall was only half that of the 11-year average.

Field 13 East had a total rainfall closely approximating the average with November 1931 and February, July and September 1932 drier, and March and April 1932 wetter than usual.

Fields 13 and 17 West also experienced a total rainfall not far from the normal, but with November 1931 and February and July 1932 drier, and April and May 1932 wetter than normal.

Composite soil samples of all the various sites of the variety trials at Sophia Experiment Station have not been collected and examined, but reference to the report of a soil survey of Sophia Experiment Station (*Agr. Journ. B.G.*, III, No. 2, p. 63-71) shows that in fields 1-13 the topsoil is a markedly acid heavy silt overlying a less acid clay subsoil. In fields 14-17 the soil is definitely lighter and consists of a markedly acid fine silt overlying a slightly acid fine silt. The organic matter content of the soils of the area is, in general, low. The contents of soluble salts in the topsoils and subsoils are usually appreciable.

TABLE III.—RESULTS OF VARIETY TRIALS AT SOPHIA.

Estate:	Sophia							Sophia							Sophia						
Field:	4 East							5 East							6 East						
Age of Cycle:	Plants							Plants							Plants						
Age of Canes:	15 Months							15 Months							15 Months						
Soil	Topsoil					Subsoil		Topsoil				Subsoil			Topsoil				Subsoil		
	Markedly acid clay					Slightly acid clay		Markedly acid clay				Markedly acid clay			Markedly acid clay				Markedly acid clay		
Normal pH.:	5.52					6.75		5.35				5.47			5.34				5.86		
Exchange pH.:	4.31					5.59		4.12				4.61			4.16				4.88		
Lime Requirement, Tons:	4.3							4.8							5.0						
Organic Matter, %:	1.79							2.04							2.30						
Index of Texture:	50					55		52				53			54				56		
	Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean	Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean	Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
Mean Yields:	D. 92/17	51.00	12.92	13.61	85.4	6.60	119.56	D. 53/27	40.37	15.03	6.17	86.8	6.07	128.06	S.W. 3	40.39	15.95	2.17	91.4	6.44	125.54
	D. 52/20	49.24	13.08	10.10	89.0	6.44	116.67	D. 625	42.28	13.15	14.03	84.5	5.56	117.29	D. 625	40.70	15.08	11.74	85.7	6.14	119.69
	D. 1431/22	51.56	11.33	18.67	83.3	5.85	105.98	◇ 10	34.08	14.95	3.31	90.2	5.09	107.38	P.O.J. 1409	33.94	15.62	3.90	87.3	5.30	103.32
	D. 625	47.50	12.11	19.51	81.7	5.72	103.62	P.O.J. 2714	33.23	14.72	6.21	86.6	4.89	103.17	P.O.J. 213	32.88	13.93	5.24	86.1	4.58	89.26
	D. 593/22	50.00	11.33	15.16	85.0	5.68	102.90	D. 403/18	35.72	13.32	5.68	85.5	4.76	100.42	B.H. 10 (12)	24.26	13.83	1.44	90.8	3.21	62.57
	D. 625 P.M.	47.64	11.84	20.05	80.6	5.65	102.35	D. 6/21	43.12	9.98	31.62	75.2	4.30	90.72							
	D. 71/20	45.80	12.19	12.29	85.6	5.58	101.09	D. 602/22	30.24	14.16	8.29	85.6	4.28	90.29							
	D. 604/20	39.78	13.44	12.04	86.6	5.35	96.92	S.C. 12 (4)	32.97	12.79	7.35	87.6	4.22	89.03							
	D. 1221/22	41.50	10.93	14.54	84.5	4.54	82.25	B. 74	29.80	14.11	5.66	87.3	4.20	88.61							
	D. 620/21	31.29	12.23	13.30	85.3	3.82	69.20	I.C.T.A. 36	30.73	13.06	9.12	82.6	4.01	84.59							
	Mean:					5.52	100.00	Mean:					4.74	100.00	Mean:					5.13	100.00
	Standard Error:					.29	5.32	Standard Error:					.28	5.93	Standard Error:					.26	5.09
	Significant Difference, 20: 1:					.88	15.97	Significant Difference, 20: 1:					.84	17.80	Significant Difference, 20: 1:					.78	15.28

TABLE III. (*Contd.*)—RESULTS OF VARIETY TRIALS AT SOPHIA.

	Sophia	Sophia	Sophia
Estate:			
Field:	8 East	9 East	10 East
Age of Cycle:	Plants	Plants	Plants
Age of Canes:	13 Months	13 Months	13,5 Months
Soil:	Topsoil / Subsoil	Topsoil / Subsoil	Topsoil / Subsoil
	Markedly acid clay / Neutral clay	Markedly acid heavy silt / Slightly acid clay	Markedly acid heavy silt / Neutral clay
Normal pH:	5.54 / 7.17	5.57 / 6.68	5.82 / 7.16
Exchange pH:	4.29 / 5.86	4.92 / 5.85	4.81 / 5.96
Lime Requirement, Tons:	3.7	4.20 / 2.20	2.8
Organic Matter, %:	1.86	1.31 / 0.58	1.86
Index of Texture:	49 / 48	43 / 46	45 / 48

Mean Yields:

Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
D. 351/20	36.31	14.10	2.64	91.0	5.12	119.91
D. 204/20	32.29	14.69	2.71	88.8	4.74	111.01
D. 625	32.35	14.00	6.21	88.6	4.53	106.09
D.1034/22	33.18	13.27	4.79	88.5	4.40	103.04
D.1034/21	30.78	14.06	4.10	90.5	4.33	101.41
D. 376/17	31.76	13.56	3.77	90.3	4.31	100.94
D. 789/18	27.67	14.11	3.70	89.5	3.91	91.57
D. 238/17	30.41	12.79	4.08	89.4	3.89	91.10
D. 424/21	30.08	12.48	3.90	87.0	3.75	87.82
D. 75/20	30.74	12.17	8.69	86.5	3.74	87.59
Mean:					4.27	100.00
Standard Error:					.13	2.94
Significant Difference, 20: 1:					.38	8.82

Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
D. 573/22	35.96	14.32	1.65	90.1	5.15	117.98
P.O.J. 2878	37.73	12.94	4.35	87.7	4.88	111.80
D. 625	36.19	13.26	6.19	87.2	4.80	109.96
D. 744/21	34.00	13.13	5.49	88.6	4.73	108.36
D. 557/20	33.08	12.91	3.21	88.2	4.27	97.82
D. 699/20	31.15	12.95	4.46	87.3	4.09	93.70
D. 383/22	36.92	11.23	1.72	87.9	4.05	92.78
D. 893/21	38.16	10.44	5.75	85.3	3.98	91.18
D. 571/20	29.45	13.37	2.36	89.3	3.94	90.26
D. 663/13	36.70	12.26	5.01	87.4	3.76	86.11
Mean:					4.36	100.00
Standard Error:					.16	3.60
Significant Difference, 20: 1:					.47	10.80

Variety	Cane per Acre Tons	Sucrose in Cane %	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
D. 207/20	34.98	13.42	85.4	4.69	114.53
D. 805/22	36.05	12.51	84.4	4.51	110.13
D. 602/22	34.03	13.17	84.4	4.49	109.65
D. 203/20	42.99	10.39	79.1	4.46	108.94
D. 625	37.02	11.96	80.6	4.45	108.67
D. 927/22	38.32	11.06	80.4	4.25	103.79
D. 6/21	39.24	9.81	70.8	3.86	94.26
D. 73/20	30.40	12.20	81.4	3.71	90.60
D.1175/22	32.42	11.18	82.1	3.63	88.64
D. 918/22	28.65	10.08	75.7	2.90	70.82
Mean:... ...				4.09	100.00
Standard Error: ...				.26	6.25
Significant Difference, 20: 1:				.77	18.75

TABLE III. (*Contd.*)—RESULTS OF VARIETY TRIALS AT SOPHIA.

Estate:	Sophia									Sophia							
Field:	13 East									14 East							
Age of Cycle:	1st Ratoons									Plants							
Age of Canes:	11.75 Months									14 Months							
Soil:	Topsoil					Subsoil				Topsoil					Subsoil		
	Markedly acid clay					Neutral clay				Markedly acid fine silt					Slightly acid fine silt		
Normal pH.:	5.62					7.16				5.73					6.50		
Exchange pH.:	4.22					5.86				5.43					6.00		
Lime Requirement, Tons:	4.2									3.9					1.5		
Organic Matter, %:	2.18									1.08					0.48		
Index of Texture:	52					49				32					30		
	Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre	Combined Results Plants and 1st Ratoons		Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre	
		Tons	%			Tons	% Mean	Variety	Sucrose in Cane per Acre Tons		Tons	%			Tons	% Mean	
Mean Yields:	P.O.J. 2725	25.98	14.98	3.96	90.1	3.89	116.46	D. 625	6.65	D. 625	42.62	13.62	12.53	86.8	5.71	107.29	
	P.O.J. 2727	25.28	15.32	5.52	88.6	3.87	115.86	P.O.J. 2727	6.58	D. 602 22	36.79	13.19	9.67	86.9	4.93	92.67	
	D. 625	26.05	14.06	13.51	86.5	3.66	109.58	P.O.J. 2725	6.52								
	D. 557/20	27.05	13.02	7.37	86.7	3.52	105.38	D. 695/13	6.35								
	D. 695/13	25.60	13.59	6.97	87.6	3.48	104.19	D. 557/20	6.08								
	S.C. 12 (4)	25.18	13.35	5.24	90.0	3.36	100.59	S.C. 12 (4)	5.74								
	B.H. 10 (12)	20.25	15.35	5.22	92.3	3.11	93.11	D. 351/20	5.67								
	D. 689/13	27.17	10.95	18.27	79.9	2.98	89.22	B.H. 10 (12)	5.54								
	D. 351 20	23.73	12.49	12.07	86.0	2.96	88.62	D. 835/18	5.52								
	D. 835 18	21.72	11.94	10.88	85.8	2.59	77.54	D. 689/13	5.49								
	Mean:					3.34	100.00			Mean:					5.32	100.00	
	Standard Error:					.27	7.96			Standard Error:					.12	2.29	
	Significant Difference, 20: 1:					.80	23.90			Significant Difference, 20: 1:					.37	6.88	

TABLE III. (*Contd.*)—RESULTS OF VARIETY TRIALS AT SOPHIA.

Estate:	Sophia	Sophia
Field:	13 West	17 West
Age of Cycle:	2nd Ratoons	1st Ratoons
Age of Canes:	11.75 Months	11.50 Months
Soil:	Topsoil / Subsoil	Topsoil / Subsoil
	Markedly acid heavy silt / Acid clay	Markedly acid fine silt / Markedly acid fine silt
Normal pH:	5.17 / 6.10	5.38 / 5.05
Exchange pH:	4.67 / 5.38	5.00 / 4.45
Lime Requirement, Tons:	6.10 / 3.50	4.80 / 5.20
Organic Matter, %:	1.62 / 0.60	1.24 / ..
Index of Texture:	13 / 30	32 / 38

Mean Yields:

Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
P.O.J. 2727	24.11	16.14	6.70	89.0	3.89	120.43
D. 625	25.31	14.77	10.87	88.5	3.76	116.41
D. 695/13	23.07	15.43	3.77	89.9	3.56	110.22
P.O.J. 2725	20.06	17.33	4.61	89.9	3.48	107.74
D. 557/20	21.48	15.37	5.90	89.5	3.32	102.79
S.C. 12 (4)	22.44	14.73	4.34	92.5	3.30	102.17
D. 835/18	21.30	14.43	13.11	87.3	3.07	95.05
D. 351/20	17.49	15.47	8.81	88.8	2.70	83.59
D. 689/13	21.17	12.48	17.38	82.9	2.64	81.73
B.H. 10(12)	16.37	15.94	4.59	93.2	2.61	80.80
Mean:					3.23	100.00
Standard Error:					.17	5.24
Significant Difference, 20 : 1 :					.51	15.73

Combined Results 1st and 2nd Ratoons		
Variety	Sucrose in Cane per Acre Tons	
D. 625	6.49	
P.O.J. 2727	6.31	
D. 695/13	6.11	
P.O.J. 2725	5.82	
D. 557/20	5.38	
S.C. 12 (4)	5.09	
D. 835/18	4.92	
D. 689/13	4.88	
D. 351/20	4.54	
B.H. 10(12)	4.31	

Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
D. 666/18	36.91	14.22	14.83	83.8	5.25	131.91
D. 625	31.01	14.12	11.95	86.3	4.37	109.80
S.C. 12 (4)	28.36	13.62	6.18	90.2	.86	96.98
B.H. 10(12)	21.92	16.11	4.13	92.1	3.53	88.69
D. 73/20	20.92	13.70	8.63	86.9	2.87	72.11
Mean:					3.98	100.00
Standard Error:					.17	4.27
Significant Difference, 20 : 1:					.51	12.81

Combined Results Plants and 1st Ratoons	
Variety	Sucrose in Cane per Acre Tons
D. 666/18	8.33
D. 625	7.55
S.C. 12 (4)	6.41
B.H. 10(12)	5.82
D. 73/20	5.60

Field 4 East, which had been rested for a number of years gave a rather heavy tonnage of cane, for Sophia, but the sucrose content of the cane was, on the whole, low, while glucose ratios were abnormally high. The varieties tested fall into three groups with D. 92/17 and D. 52/20 at the top, D. 1431/22, D. 625, D. 593/22, D. 625 (P.M.), and D. 71/20 much alike, while D. 1221/22 and D. 620/21 appear definitely inferior. D. 92/17 gave a definitely better yield of sucrose per acre than D. 625, this being due partly to a higher cane yield and partly to a better sucrose content. The juice was also better both as regards purity and glucose ratio. It will be interesting to see what this cane does as a ratoon. In the meantime it will be planted in another variety trial to determine whether it is a consistently high yielder. D. 52/20 gave a 13 per cent. increase in yield over D. 625 and also deserves further trial. D. 625 (P.M.) is a strain of D. 625 procured from Plantation Port Mourant. It was tested in response to the request of several planters who thought that the consistently high yields obtained at Port Mourant might be attributed to that Estate possessing a strain of D. 625 different from the D. 625 planted elsewhere. It would not appear that the idea was correct. The yields of cane and sucrose from this experiment are graphically presented in Figure I.

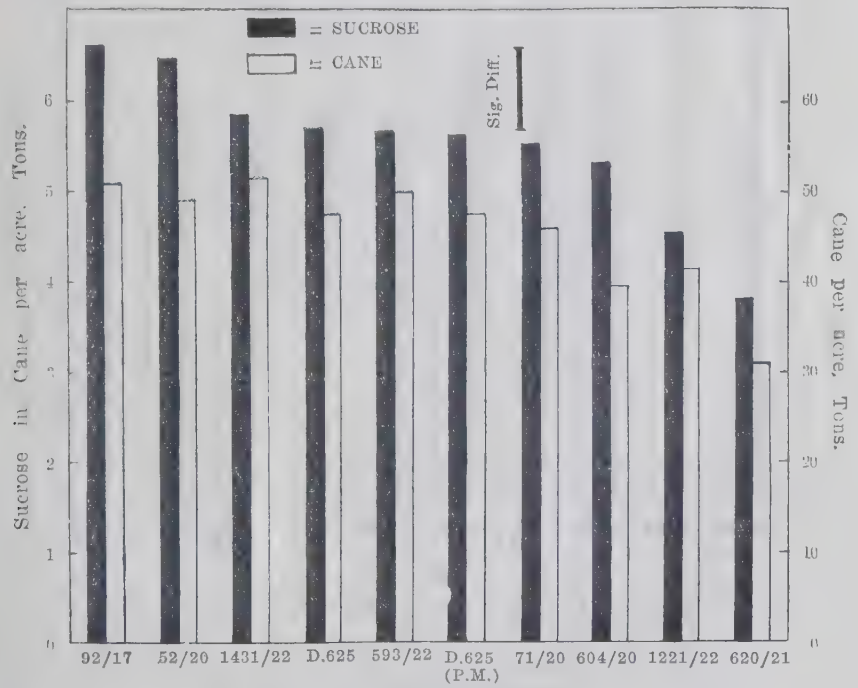

FIG. I.

Yields of Sucrose and Cane, per acre, from Field 4E., Sophia (Plant Canes).

In field 5 East, D. 53/27 gave an 11 per cent increase in yield over D. 625. The difference is not significant but is suggestive. However, D. 53/27 did very poorly in another trial at Non Pareil and its growth in nurseries on the various estates has been, at times, unsatisfactory. It should not therefore be extended, at any rate for the present. D. 625 holds second place and Diamond 10 third, with a yield 10 per cent under that of D. 625. This is unusual, for in six plant cane and two first ratoon trials reaped so far, Diamond 10 has always topped D. 625 save in this instance and in one first ratoon trial at Blairmont where D. 625 gave a yield less than 1 per cent higher. Figure II shows the results in the form of a graph. It is of interest to note D. 6/21 which gave the highest yield of cane but came sixth in order of sucrose output, its juice being very poor. Judging by the high glucose ratio, the cane was unripe at the time of harvest. It is proposed to put it into a maturity test to determine the optimum age for reaping.

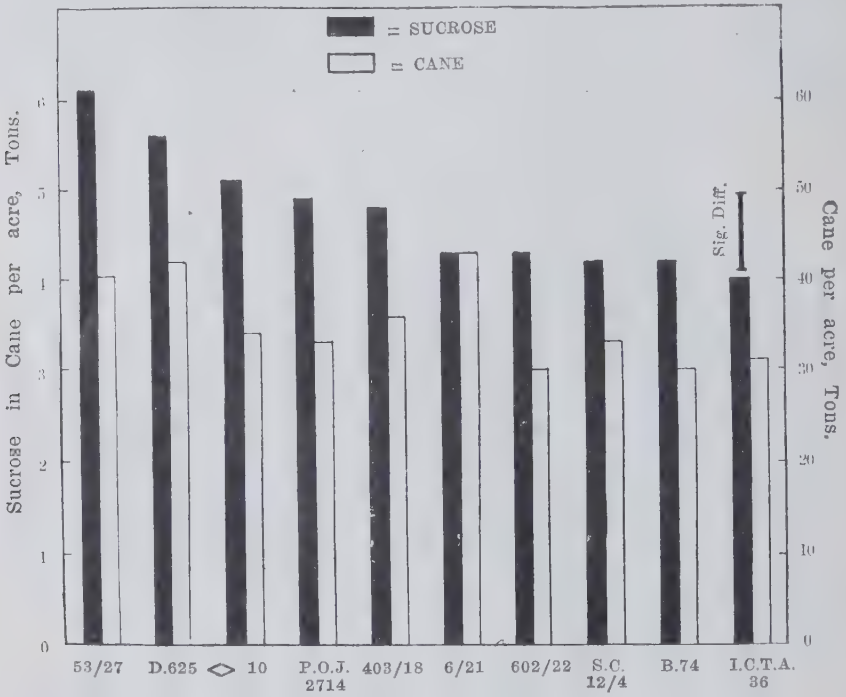

FIG. II.

Yields of Sucrose and Cane, per acre, from Field 5E., Sophia (Plant Canes).

In field 6 East, three Java canes were tried against D. 625 and B.H. 10 (12). The latter proved to be definitely inferior to all the others, and S.W. 3 and D. 625 to be definitely better than the rest as plant canes. S. W. 3

gave a suggestive but not statistically significant increase over D. 625. It appears to have been reaped at the optimum time for the glucose ratio of the juice was remarkably low, and the sucrose in cane and juice purity high. This variety, which was produced in Java in 1904 from a cross of Dark Cheribon by Batjan (EARLE), will be put into further tests.

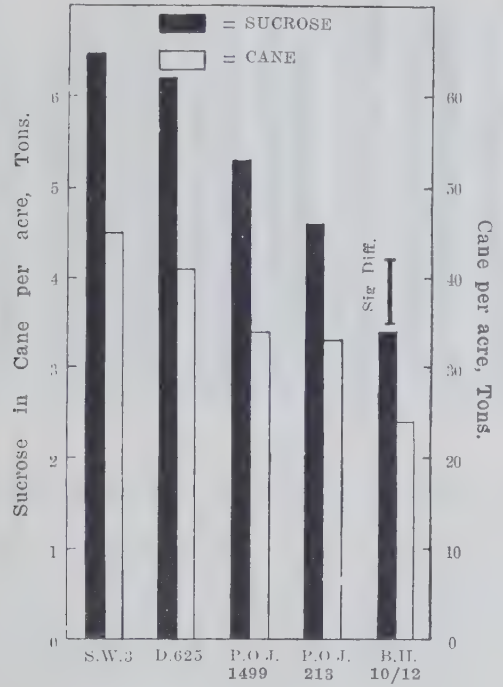

FIG. III.

Yields of Sucrose and Cane, per acre, from Field 6E., Sophia (Plant Canes).

Field 8 E.: Both cane yields and analytical figures were satisfactory. The standard error of the trial was low. D. 351/20 gave a good tonnage and had a high sucrose content. It was definitely better than all the canes in the trial except D. 204/20 which it led by the fairly wide margin of 0.38 ton sucrose in cane per acre. D. 351/20 came first in a plant cane trial at Lusignan last year and was definitely better than D. 625. It also came first in a plant cane trial executed by Bolin on peaty "back land" soil at Blairmont Estate, but on old, heavy "front land," on the same Estate, he reported it as being beaten by D. 625 both as plants and ratoons. D. 204/20 gave a good account of itself and should be tried again.

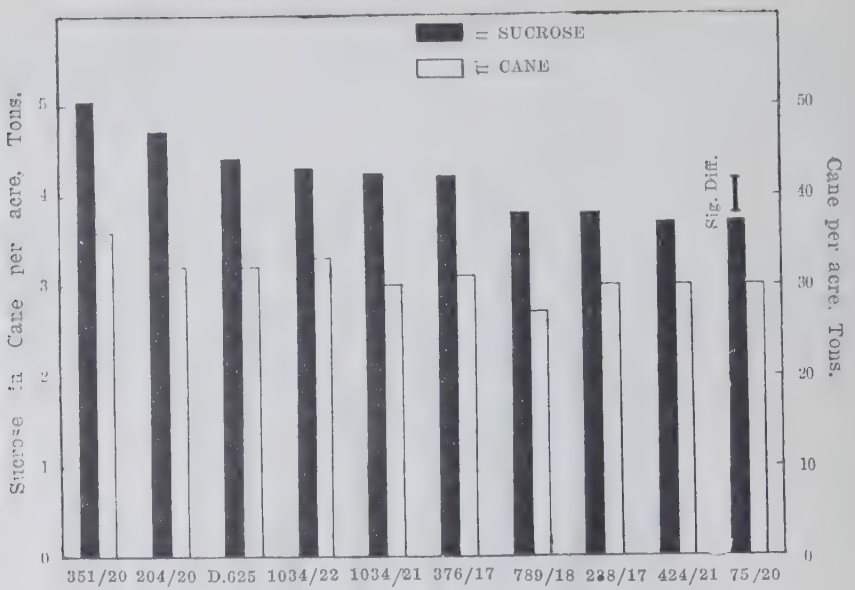

FIG. IV.

Yields of Sucrose and Cane, per acre, from Field 8E., Sophia (Plant Canes).

Field 9 E.: Here again the yields were satisfactory for the Station. It is obvious from the glucose ratios and purities that the canes were ripe. D. 573/22 was definitely better than the last six canes in the list and gave a very suggestive, though not statistically significant, increase of 0.35 ton sucrose in cane per acre over D. 625. In view of its superior sucrose content and the high purity of its juice, coupled with a satisfactory tonnage, this cane promises well. P.O.J. 2878 gave 0.08 ton sucrose in cane per acre more than D. 625, but 0.27 ton less than D. 573/22. Its analytical figures are similar to those from D. 625. No other cane on the list calls for special comment except D. 663/13. Its position is a surprise for in a previous experiment at Blairmont it has done very well and on that Estate, where it is being grown commercially, it has given considerable promise.

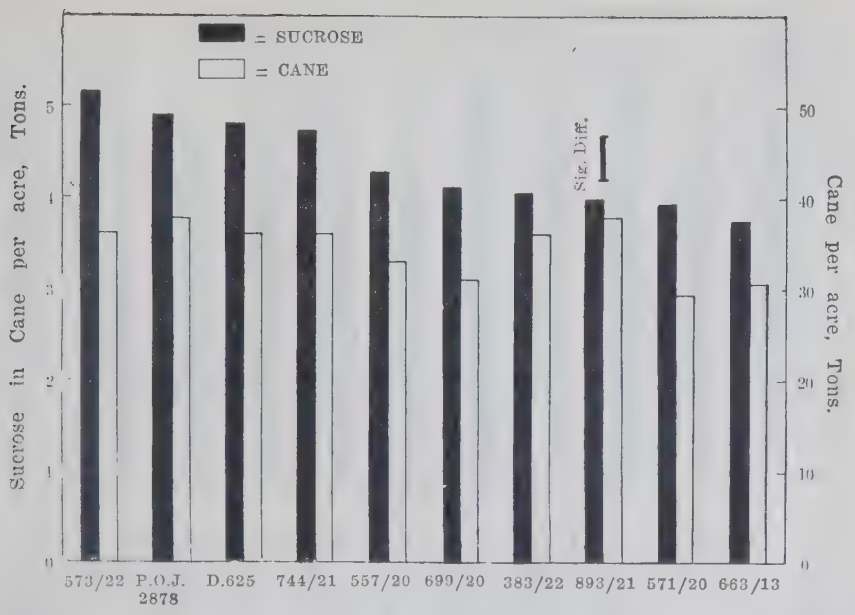

FIG. V.

Yields of Sucrose and Cane, per acre, from Field 9E., Sophia (Plant Canes).

Field 10 E.: On the whole the juices from this field were not satisfactory, but the yield in cane was good for the Station. With five replicates the significant difference is large. D. 207/20 was definitely better than the last four canes in the list, and D. 895/22, D. 602/22, D. 203/20 and D. 625 definitely better than the last two. D. 203/20 and D. 6/21 gave good yields of cane but their juices were very poor. It is proposed to investigate both of these varieties further with a view to finding the optimum age at which they should be reaped and determining their yields of sucrose under such conditions, for it is well known that the Colony's standard cane, D. 625 was a poor sucrose yielder in its early years. Meanwhile the high sucrose contents and purities of D. 207/20 and D. 602/22, under the conditions of the trial, are outstanding, and the increase of a quarter of a ton sucrose per acre given by the former cane over D. 625 is very suggestive although not definitely significant. D. 895/22 seems worthy of further trial.

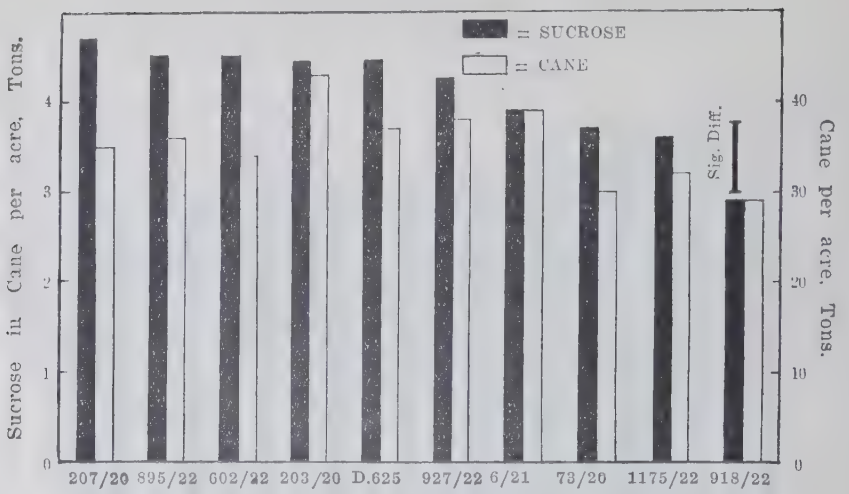

FIG. VI.

Yields of Sucrose and Cane, per acre, from Field 10E., Sophia (Plant Canes).

Fields 13 East and West contained the same varieties and may well be considered together. D. 625 proved to be the best of the varieties tried. It is of interest to note the upward trend the P.O.J. canes take in the first and second ratoons. These experiments are being stopped, but it would appear advisable to put down a test with these and other Javan varieties against D. 625 and Diamond 10, and to keep on ratooning for a long time. General observations point to several of the Javan canes being sturdy ratooners and it may be that some of them would prove to be more economical in the long run.

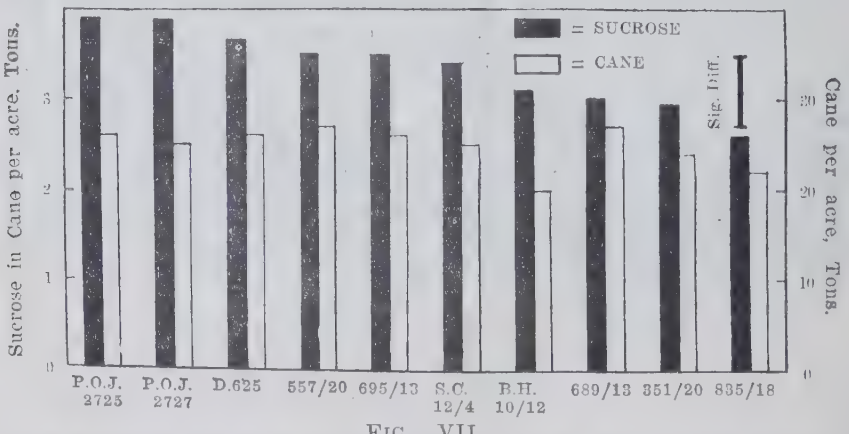

FIG. VII.

Yields of Sucrose and Cane, per acre, from Field 13E., Sophia (First Ratoons).

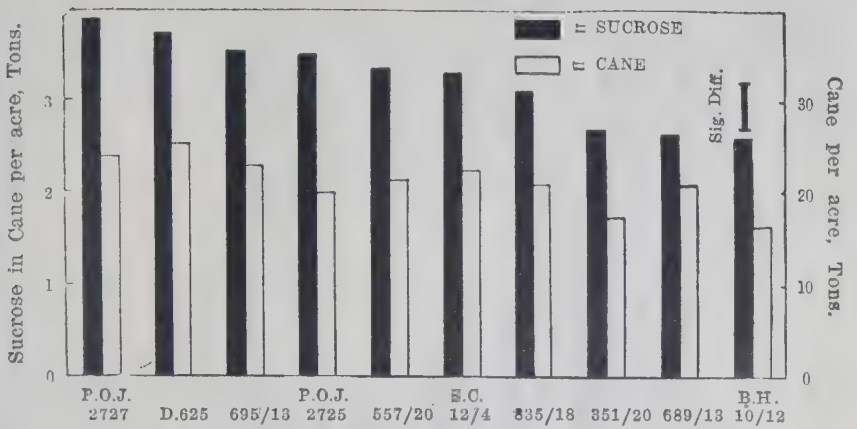

FIG. VIII.

Yields of Sucrose and Cane, per acre, from Field 13W., Sophia (Second Ratoons).

In Field 14 East, D. 602/22 and D. 625 were compared at three different row spacings. Combining the results for all spacings, D. 625 proved definitely superior to D. 602/22 as a plant cane under the conditions of this experiment. The results are graphically presented in Figure IX.

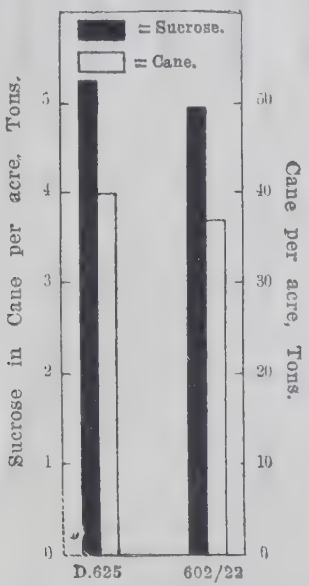

FIG. IX.

Yields of Sucrose and Cane, per acre, from Field 14E., Sophia (Plant Canes).

Field 17 West: D. 666/18 proved to be significantly better than D. 625 in the first ratoons and, as the latter only led it by a narrow margin in the plant canes, 666/18 came an easy first when both crops were considered. This seedling is a heavy yielder, but its juice is frequently disappointing. It is proposed to put it into a maturity test with other heavy but low purity canes.

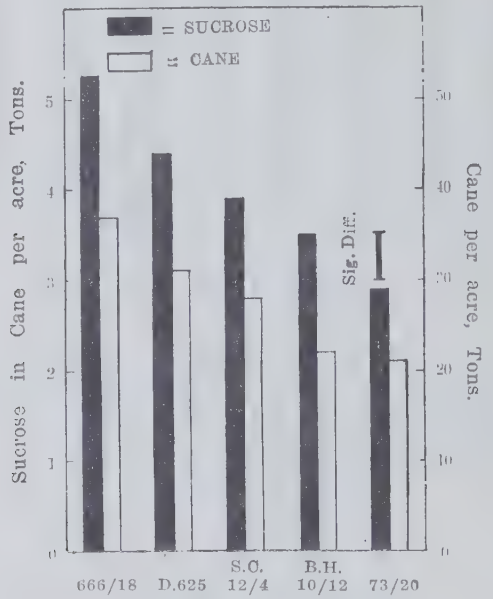

FIG. X.

Yields of Sucrose and Cane, per acre, from Field 17W., Sophia (First Ratoons).

PLANTATION BLAIRMONT.

The two trials reaped were:

TABLE IV.—EXPERIMENTS REAPED AT PLANTATION BLAIRMONT.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of		Type of Layout
			Planting or Previous Reaping	Reaping	Treatments	Replicates	
11 R.	1st Ratoons	12.25	28.X.31	4.XI.32	10	5	Randomised Blocks
18 R.	Plants	16.0	21.V.31	18.IX.32	12	7	" "

Table V shows the actual rainfall at Blairmont and the monthly average for that Estate during the experimental period.

TABLE V.—RAINFALL AT PLANTATION BLAIRMONT.

Month	Rainfall					
	1931-1932 Inches.			1911-1931 Inches.		
June	Plant Canes 122.82 ins.	11.97	1st Ratoons 93.82 ins.	Plant Canes 112.27 ins.	12.28	1st Ratoons 80.98 ins.
July		8.85			10.36	
August		3.02			6.41	
September		5.43			2.24	
October		1.67			2.53	
November		4.27			3.71	
December		7.59			9.55	
January		5.82			9.00	
February		4.81			4.86	
March		10.85			4.33	
April		19.22			5.19	
May		11.20			10.52	
June		11.78			12.28	
July		7.33			10.36	
August		6.83			6.41	
September		2.18			2.24	
October		1.94			2.53	

It will be seen that both experiments had favourable seasons with a rainfall 10 inches above the average for the plant canes and 13 inches above the average for the ratoons.

The topsoil of field 11 R. is a markedly acidic clay overlying a similar subsoil. The organic matter content is low and the carbon-nitrogen ratio very narrow. Both soil and subsoil contain considerable amounts of soluble salt.

The topsoil of field 18 R. is a highly acidic fine silt overlying a highly acidic clay. It contains an average amount of organic matter with a normal carbon-nitrogen ratio. The salinity of the soil and subsoil is low.

Table VI.—Results of Variety Trials at Blairmont.

Estate:	Blairmont									Blairmont						
Field:	11 Riverside									18 Riverside						
Age of Cycle:	1st Ratoons									Plants						
Age of Canes:	12.25 Months									16 Months						
Soil	Topsoil					Subsoil				Topsoil				Subsoil		
	Markedly acid clay					Markedly acid clay				Highly acid heavy silt				Highly acid clay		
Normal pH.:	5.52					5.40				4.81				4.62		
Exchange pH.:	4.73					4.83				3.58				3.58		
Lime Requirement, Tons:	4.90					4.30				10.70				12.40		
Organic Matter, %:	1.18					.79				1.73				1.46		
Index of Texture:	46					47				41				47		

	Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre	Combined Results Plants and 1st Ratoons		Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre
		Tons	%			Tons	% Mean	Variety	Sucrose in Cane per Acre Tons		Tons	%			Tons	% Mean
Mean Yields:	D.625	43.31	14.76	11.68	87.5	6.10	113.38	◇ 10	12.93	◇ 10	40.14	15.13	8.33	91.0	6.07	114.09
	◇ 10	39.75	15.24	7.26	91.9	6.05	112.45	D.835/18	12.32	D.424/21	39.54	14.86	5.23	91.4	5.89	110.71
	D.835/18	40.38	14.55	7.80	87.9	5.91	109.85	D.625	11.68	D.666/18	43.92	13.30	10.52	88.7	5.84	109.77
	S.C.12/4	39.35	13.99	7.99	89.1	5.51	102.42	D.663/13	11.12	D.835/18	37.21	15.30	9.16	89.3	5.69	106.95
	B.H.10(12)	33.33	15.95	4.98	90.2	5.33	99.07	D.666/18	10.99	D.351/20	37.87	14.58	5.62	90.9	5.52	103.76
	D.663/13	37.37	14.13	13.20	88.5	5.24	97.40	D.814/12	10.89	D.695/13	36.12	15.22	6.37	90.6	5.50	103.38
	D.684/21	43.05	12.04	23.27	82.2	5.20	96.66	D.684/21	10.57	D.625	39.22	13.20	13.61	87.6	5.21	97.93
	D.666/18	40.51	12.80	14.25	85.2	5.18	96.28	S.C.12(4)	10.31	D.602/22	36.62	13.87	9.23	87.6	5.08	95.49
	D.814/12	36.65	14.03	8.23	88.7	5.13	95.35	B.H.10(12)	10.28	D.684/21	44.38	11.15	25.69	80.5	4.95	93.05
	Bourbon	29.25	14.06	6.87	87.7	4.11	76.39	Bourbon	7.99	D.814/12	36.38	13.48	8.12	89.4	4.90	92.11
										D.557/20	36.16	13.25	6.40	88.5	4.79	90.04
										D.663/13	34.63	12.61	12.83	87.5	4.37	82.14
	Mean:					5.38	100.00			Mean:					5.32	100.00
	Standard Error:					.38	7.10			Standard Error:					.23	4.38
	Significant Difference, 20: 1:					1.15	21.38			Significant Difference, 20: 1:					.70	13.14

Field 11 R.: D. 625 came up from sixth place in the plant canes to first in the first ratoons; Diamond 10 and D. 835/18, which were, respectively, first and second in the plant canes, followed in the order named. When the combined results of plant canes and first ratoons are considered, Diamond 10 comes an easy first, with D. 835/18 second, leading D. 625 by a wide margin. D. 663/13 which has been extended on a commercial scale on this estate, has not come up to expectations on this soil type; the same is true of D. 814/12. D. 684/21 gives a very high yield of cane on this soil, averaging 50.65 tons per acre in the plant canes and 43.05 tons in the first ratoons. Its sucrose content, however, is low. It is proposed to try it out in a maturity test.

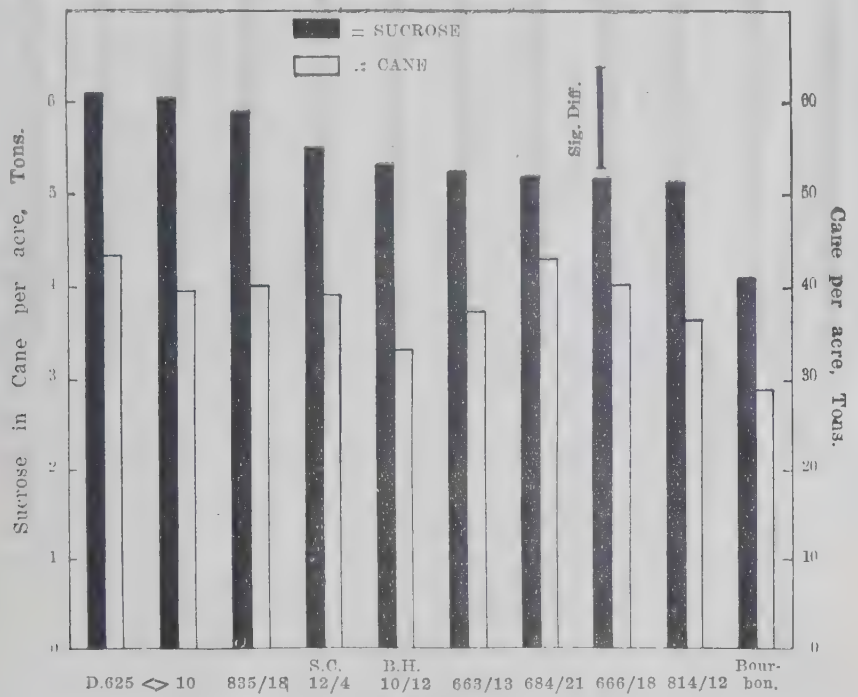

FIG. XI.

Yields of Sucrose and Cane, per acre, from Field 11R., Blairmont (First Ratoons).

Field 18 R.: Diamond 10 proved to be significantly better than D.625, leading it by 16 per cent, while D.424/21, which led D.625 by 13 per cent, might also be considered statistically better. D.835/18, which showed up well, both as plants and as ratoons in field 11 R., again led D.625 by a wide margin. It is of interest to note that in all three experiments on this Estate, this variety has given juice purities and sucrose contents equal to or above those of D.625. From this standpoint, Diamond 10 has been even more satisfactory.

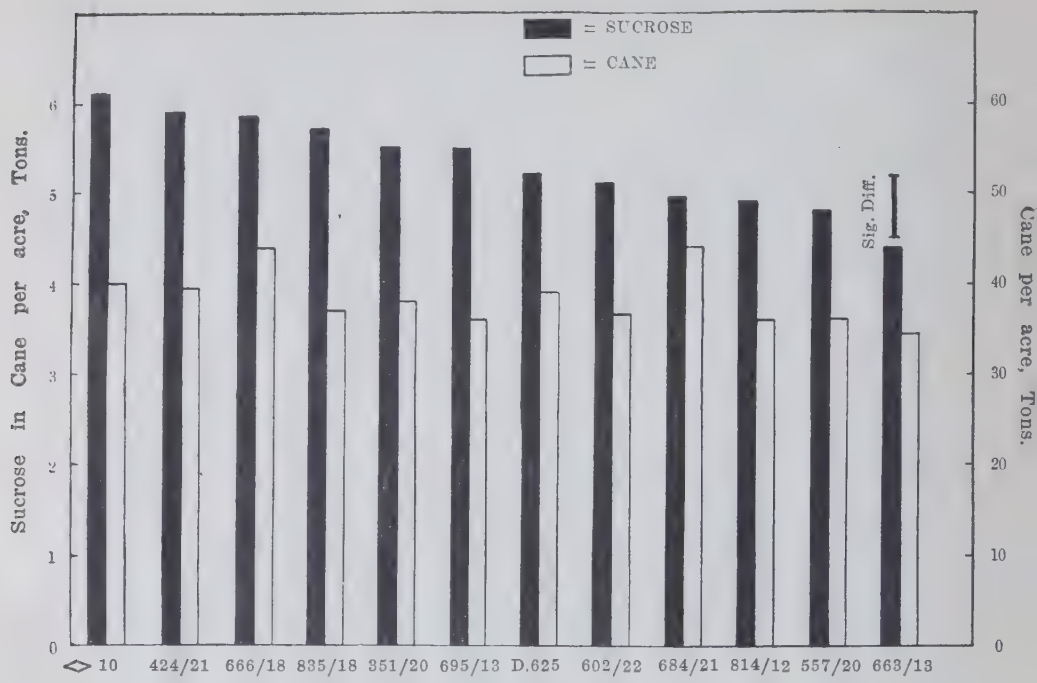

FIG. XII.

Yields of Sucrose and Cane, per acre, from Field 18R., Blairmont (Plant Canes).

PLANTATION DIAMOND.

The two trials reaped were :

TABLE VII.—EXPERIMENTS REAPED AT PLANTATION DIAMOND.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of		Type of Layout
			Planting or Previous Reaping	Reaping	Treatments	Replicates	
53 G.D.	1st Ratoons	12.0	24.IX.31	28.IX.32	10	6	Randomised Blocks
89 G.D.	Plant Canes	16.4	28.V.31	11.X.32	12	7	,, ,,

The following table shows the monthly rainfall received by the experiments and the normal rainfall which might have been expected.

TABLE VIII.—RAINFALL AT PLANTATION DIAMOND.

Month	Rainfall					
	1931-1932 Inches.			1911-1931 Inches.		
June	Plant Canes 155.97 ins.	15.83	1st Ratoons 104.31 ins.	Plant Canes 141.38 ins.	14.12	1st Ratoons 99.25 ins.
July		19.79			11.98	
August		6.36			8.05	
September		6.50			3·92	
October		6.50			4.06	
November		2.01			6.14	
December		9.79			12.38	
January		9.85			8.92	
February		3.24			5.12	
March		6.30			5.05	
April		17.12			5.41	
May		13.23			14.10	
June		16.64			14.12	
July		10.46			11.98	
August		8.03			8.05	
September		1.14			3.92	
October		2.28			4.06	

It will be seen that both experiments received a total fall above the average. The distribution was, on the whole, satisfactory, with dry spells in November 1931 and September—October 1932, and an abnormally wet April in 1932.

The topsoil of Field 53 G.D. is a highly acid clay overlying a highly acid clay subsoil. The organic matter content of the topsoil is low, that of the subsoil is normal. The carbon-nitrogen ratio of the topsoil is narrow, that of the subsoil is normal. The content of soluble salts is low. The theoretical lime requirement is above the normal.

The topsoil of Field 89 G.D. is a highly acid pegassy clay overlying a highly acid pegassy clay subsoil. The organic matter content of the topsoil is normal for this class of soil, that of the subsoil is above the average. The carbon-nitrogen ratios are wider than the average. The soluble salt contents are normal. The theoretical lime requirement of the topsoil is below the average, that of the subsoil is normal.

TABLE IX.—RESULTS OF VARIETY TRIALS AT DIAMOND.

Estate:	Diamond											Diamond						
Field:	53 G.D.											89 G.D.						
Age of Cycle:	1st Ratoons											Plants						
Age of Canes:	12 Months											16.4 Months						
Soil:	Topsoil					Subsoil						Topsoil				Subsoil		
	Highly acid clay					Highly acid clay						Highly acid pegassy clay				Highly acid pegassy clay		
Normal pH:	4.67					4.75						4.60				4.60		
Exchange pH:	3.73					3.77						3.70				3.80		
Lime Requirement, Tons:	14.40					14.30						14.30				...		
Organic Matter, %:	1.87					1.56						3.04				..		
Index of Texture:	48					52						49				49		
	Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre	Combined Results Plants and 1st Ratoons		Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre		
		Tons	%			Tons	% Mean	Variety	Sucrose in Cane per Acre Tons		Tons	%				Tons	% Mean	
Mean Yields:	◇ 10	31.91	14.01	9.39	88.2	5.17	142.42	◇ 10	9.87	D.927/22	49.93	12.83	16.97	82.9	6.41	120.94		
	S.C.12(4)	26.71	15.98	4.42	92.2	4.80	132.23	S.C.12(4)	8.23	D.602/22	40.33	15.49	6.94	91.7	6.25	117.92		
	◇ 17	28.99	12.70	11.28	80.6	3.68	101.38	◇ 17	7.52	◇ 10	36.05	16.86	5.03	91.2	6.08	114.73		
	D.625	30.75	11.73	29.87	78.3	3.61	99.45	D.625	7.47	D.557/20	36.20	15.99	5.64	93.1	5.80	109.43		
	D.628/20	22.84	15.32	11.61	88.4	3.50	96.42	D.557/20	7.32	S.C.12(4)	33.17	16.51	3.69	93.4	5.47	103.20		
	D.557/20	27.52	12.49	11.18	86.6	3.44	94.76	D.628/20	6.52	◇ 5	40.86	13.29	10.12	87.5	5.43	102.45		
	D.666/18	28.98	11.21	25.18	75.5	3.25	89.53	D.666/18	6.51	P.O.J.2727	37.06	14.19	10.05	88.4	5.26	99.24		
	D.73/20	27.15	11.79	15.03	85.4	3.20	88.15	D.73/20	6.02	D.309/22	35.96	14.33	4.67	86.6	5.15	97.17		
	D.351/20	22.29	13.19	13.42	86.6	2.94	80.99	D.351/20	5.85	D.663/13	35.79	13.85	11.76	89.3	4.95	93.40		
	D.835/18	22.25	12.39	17.64	84.3	2.75	75.75	D.835/18	5.76	D.918/22	34.53	13.37	15.23	84.3	4.61	86.98		
										D.118/02	29.97	14.46	9.43	88.8	4.33	81.70		
										D.613/21	29.09	13.07	8.80	89.3	3.80	71.70		
	Mean:					3.63	100.00			Mean:					5.30	100.00		
	Standard Error:					.22	6.04			Standard Error:					.27	5.13		
	Significant Difference, 20: 1: ..					.66	18.12			Significant Difference, 20: 1: ...					.82	15.39		

Field 53 G.D.: Diamond 10, which was first in the plant canes last year, leads again by a margin of 10 per cent over S. C. 12(4), than which it is not, however, significantly better. S.C. 12 (4) itself has risen from fifth place in the plant canes to second in the first ratoons and is significantly better than all the other canes in the experiment. It owes this position largely to its excellent juice which was even better than that of Diamond 10. When the results of both crops are considered, Diamond 10 comes easily first with S.C. 12 (4) second, and well above Diamond 17, which is just above D.625.

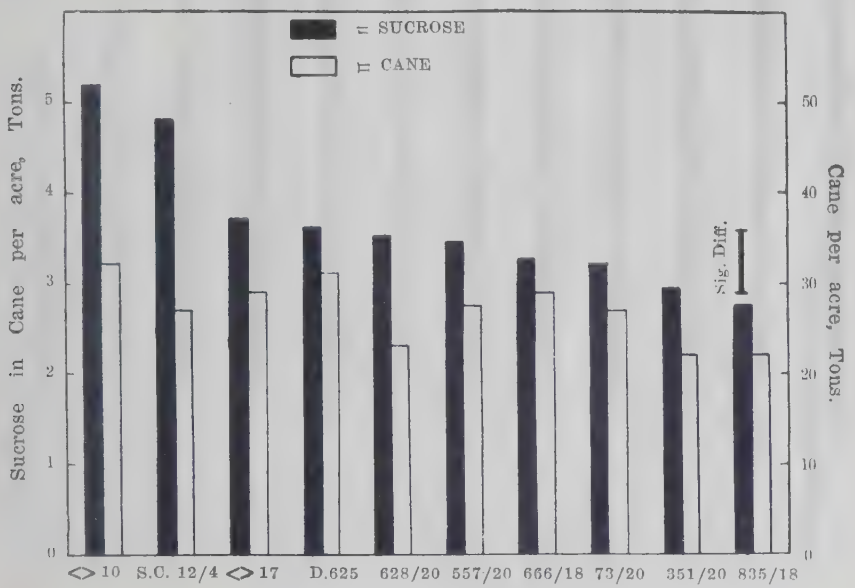

FIG. XIII.

Yields of Sucrose and Cane, per acre, from Field 53G.D., Diamond (First Ratoons).

Field 89 G.D.: On this soil D. 927/22 leads D. 602/22 by 3 per cent and Diamond 10 by 6 per cent, but is not significantly better than either. All three canes gave good yields and appear, at least as plants, to be in a class well above the others under trial.

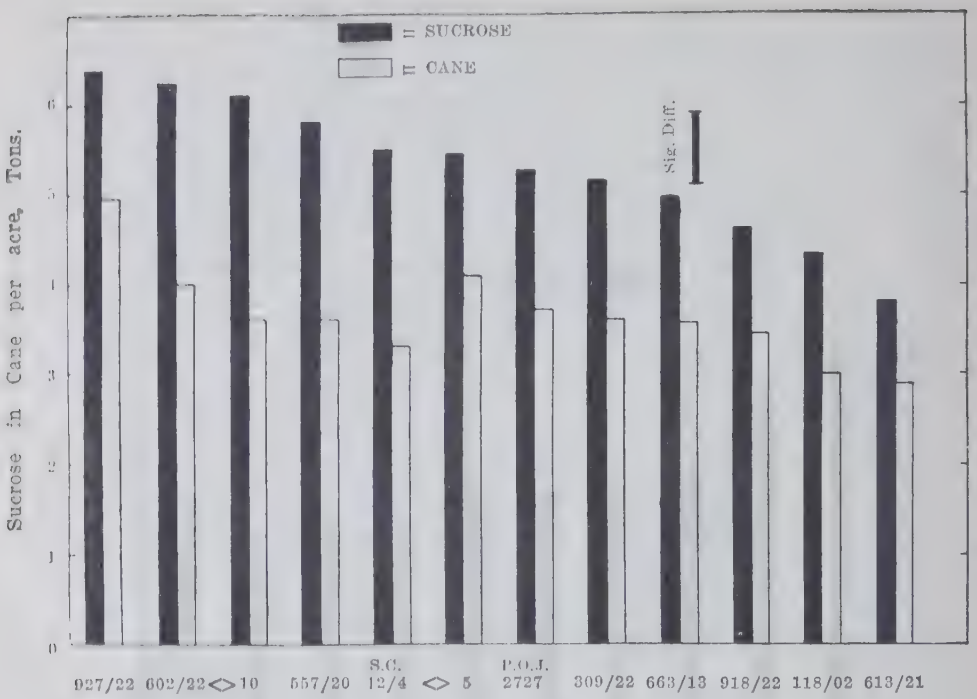

FIG. XIV.

Yields of Sucrose and Cane, per acre, from Field 89 G.D., Diamond (Plant Canes).

PLANTATION LUSIGNAN.

Two trials were reaped, viz.

TABLE X.—EXPERIMENTS REAPED AT PLANTATION LUSIGNAN.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of	
			Planting or Previous Reaping	Reaping	Treatments	Replicates
19 E.	1st Ratoons	12.0	9.X.31	5.X.32	7	5
22 B., M.R.	Plants	15.5	15.V.31	24.VIII.32	12	7

Table XI shows the actual rainfall at Lusignan and the monthly average for the Estate during the experimental period.

TABLE XI.—RAINFALL AT PLANTATION LUSIGNAN.

Month	Rainfall					
	1931-1932 Inches.			1917-1931 Inches.		
May	Plant Canes 140.06 ins.	13.44	1st Ratoons 86.63 ins.	Plant Canes 115.20 ins.	10.63	1st Ratoons 77.59 ins.
June		13.23			12.14	
July		14.86			9.15	
August		8.33			5.69	
September		3.68			2.24	
October		6.87			3.02	
November		.84			4.94	
December		7.34			10.29	
January		10.66			7.92	
February		1.89			3.88	
March		5.12			3.52	
April		16.15			4.17	
May		12.51			10.63	
June		13.06			12.14	
July		5.81			9.15	
August		6.27			5.69	
September		0.11			2.24	

It will be seen that both experiments were well watered, the totals being distinctly above the normal with only November 1931 and September 1932 markedly dry.

The topsoil of Field 19 E. is a markedly acid heavy silt overlying a markedly acid heavy silt subsoil. The organic matter contents and the carbon : nitrogen ratios are normal. The amounts of soluble salts are normal. The theoretical lime requirements are above the average.

The topsoil of Field 22 B., M.R. is a markedly acid heavy silt overlying a slightly acid heavy silt subsoil. The organic matter content is normal. The carbon : nitrogen ratio is wider than the average. The contents of soluble salts are higher than is usual. The theoretical lime requirement is normal.

TABLE XII.—RESULTS OF VARIETY TRIALS AT LUSIGNAN.

Estate:	Lusignan										Lusignan								
Field:	19 East										22B Mon Repos								
Age of Cycle:	1st Ratoons										Plants								
Age of Canes:	12 Months										15.3 Months								
Soil	Topsoil					Subsoil					Topsoil				Subsoil				
	Markedly acid heavy silt					Markedly acid heavy silt					Markedly acid heavy silt				Slightly acid heavy silt				
Normal pH.:	5.50					5.37					5.50				6.70				
Exchange pH.:	4.32					4.33					4.40				5.40				
Lime Requirement, Tons:	6.70					5.00					5.20				...				
Organic Matter, %:	1.60					0.85					1.64				...				
Index of Texture:	43					41					41				45				
	Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre	Combined Results Plants and 1st Ratoons		Variety	Cane per Acre	Sucrose in Cane	Glucose Ratio	Purity	Sucrose in Cane per Acre	Sucrose in Cane per Acre			
		Tons	%			Tons	% Mean	Variety	Sucrose in Cane per Acre Tons		Tons	%			Tons	% Mean			
Mean Yields:	D.666/18	26.24	13.30	12.35	83.2	3.49	121.61	D.351/20	7.95	D.666/18	34.90	13.20	7.27	86.7	4.60	125.34			
	D.351/20	20.76	15.70	5.94	89.0	3.26	113.59	D.666/18	7.76	D.625	30.77	13.50	10.37	86.8	4.15	113.08			
	S.C.12(4)	21.63	13.65	5.81	88.5	2.95	102.79	D.447/17	7.03	D.699/20	29.60	15.84	4.61	88.5	4.01	109.26			
	D.447/17	16.96	16.15	6.86	88.3	2.74	95.47	S.C.12(4)	6.23	D.241/21	30.41	13.01	5.61	86.5	3.96	107.90			
	B.H.10(12)	17.42	15.32	4.99	89.0	2.67	93.03	B.H.10(12)	6.18	D.602/22	26.65	14.76	5.28	88.3	3.93	107.08			
	D.625	18.00	14.20	14.89	84.8	2.56	89.20	D.31/17	6.16	D.695/13	26.91	13.21	5.74	88.1	3.56	97.00			
	D.31/17	16.21	15.12	14.85	85.1	2.45	85.37	D.625	6.02	B.H.10(12)	25.68	13.44	4.53	90.0	3.45	94.01			
										D.557/20	25.73	13.36	5.29	84.6	3.44	93.73			
										D.689/13	27.14	12.57	5.13	85.4	3.41	92.92			
										D.424/21	24.43	14.44	2.75	89.8	3.39	92.37			
										D.613/21	25.03	12.24	4.18	88.0	3.07	83.65			
										S.C.12(4)	23.20	12.86	3.99	88.1	2.99	81.47			
	Mean:					2.87	100.00			Mean:					3.67	100.00			
	Standard Error:					.18	6.27			Standard Error:					.19	5.31			
	Significant Difference, 20: 1:					.54	18.82			Significant Difference, 20: 1:					.58	15.94			

Field 19 E.: As in the plant canes, both D. 666/18 and D. 351/20 have proved significantly better than D. 625 with D. 351/20 leading all the other varieties when both crops are considered. D. 447/17 and D. 31/17 have both dropped in place in the ratoons whereas S.C. 12 (4) has gone up. The juice of D. 351/20 was satisfactory but, as is frequently the case, that of D. 666/18 was unsatisfactory. D. 351/20 seems well suited to this particular area and might be given a cautious trial.

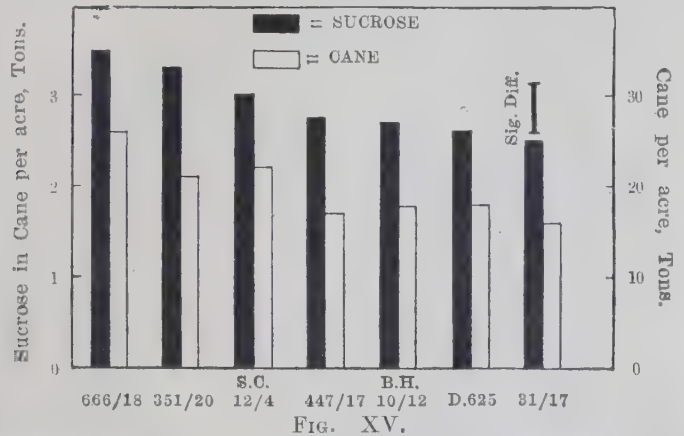

FIG. XV.

Yields of Sucrose and Cane, per acre, from Field 19E., Lusignan (First Ratoons).

Field 22 B., M.R.: The only variety to lead D. 625 was D. 666/18. The increase is marked though not statistically significant. The juices of the two canes were about the same with a higher glucose ratio for D. 625. This Estate has several acres in D. 666/18 and its progress is being closely watched.

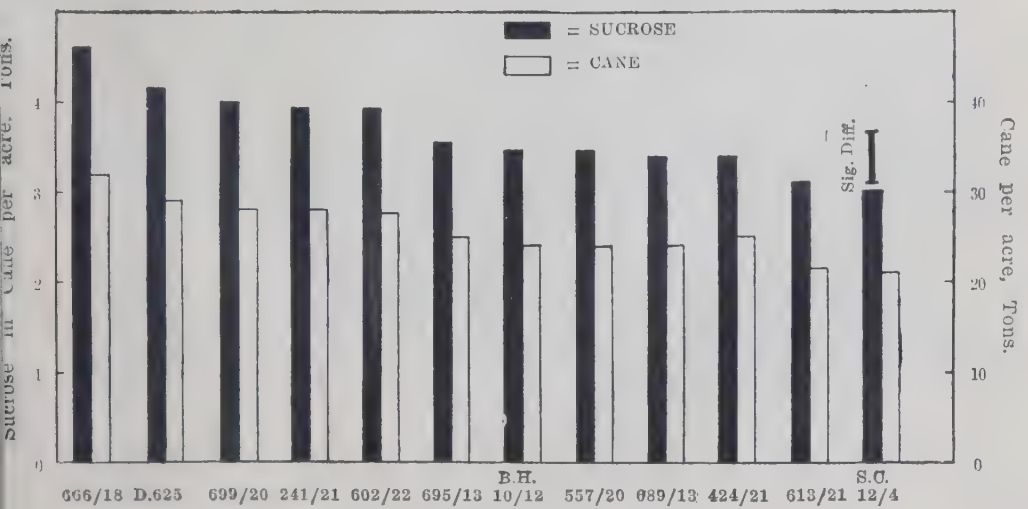

FIG. XVI.

Yields of Sucrose and Cane, per acre, from Field 22B., M.R., Lusignan (Plant Canes).

PLANTATION NON PAREIL.

One plant cane trial was reaped in Field 14 Enterprise at the age of 14.7 months. There were 11 varieties arranged in five randomised blocks, the field having been planted on 3rd September, 1931 and reaped on 24th November, 1932.

The rainfall for the experimental period and the monthly averages are compared below:

TABLE XIII.—RAINFALL AT PLANTATION NON PAREIL.

Month	Rainfall	
	1931-1932 Inches	1916-1931 Inches
September	4.02	3.17
October	6.94	3.16
November	1.23	6.35
December	6.60	11.42
January	11.51	8.47
February	2.62	4.11
March	5.51	4.17
April	18.21	4.85
May	15.32	12.21
June	14.28	13.37
July	6.20	10.59
August	8.27	7.49
September	0.15	3.17
October	0.99	3.16
November	1.13	6.35
	102.98	102.04

It will be seen that the totals are almost identical. In so far as the distribution is concerned, November 1931 and September to November 1932 may be considered abnormally dry, while April 1932 was unusually wet.

The topsoil of Field 14 Enterprise consists of a highly acid clay overlying a slightly acid clay subsoil. The organic matter content of the topsoil is below the average, that of the subsoil is normal. The carbon-nitrogen ratios are narrow. The contents of soluble salts are about the average. The theoretical lime requirement of the topsoil is below normal.

TABLE XIV.—RESULTS OF A VARIETY TRIAL AT NON PAREIL

Estate:	Non Pareil						
Field:	14 Enterprise						
Age of Cycle:	Plants						
Age of Canes:	14.7 Months						
Soil	Topsoil			Subsoil			
	Highly acid clay			Slightly acid clay			
Normal pH.:	4.88			6.25			
Exchange pH.:	3.93			5.36			
Lime Requirement, Tons:	7.1			2.3			
Organic Matter, %:	1.74			.71			
Index of Texture:	46			52			
Mean Yields:	Variety	Cane per Acre Tons	Sucrose in Cane %	Glucose Ratio	Purity	Sucrose in Cane per Acre Tons	Sucrose in Cane per Acre % Mean
	P.O.J.2878	47.81	15.57	6.88	86.6	7.44	124.83
	◇ 10	42.46	17.07	7.02	89.0	7.24	121.48
	D.602/22	47.61	14.66	12.18	86.1	6.98	117.11
	D.424/21	44.33	15.68	9.58	87.0	6.94	116.44
	D.625	46.57	14.01	26.36	84.1	6.53	109.56
	D.309/22	39.78	15.19	11.70	86.9	6.04	101.34
	S.C.12(4)	41.22	14.42	8.51	88.2	5.93	99.50
	D.666/18	44.44	12.94	22.06	80.4	5.72	95.97
	P.O.J.213	40.46	11.97	7.09	84.1	4.85	81.38
	D.699/20	31.44	14.97	8.33	84.1	4.70	78.86
	D.53/27	21.40	15.09	12.54	84.7	3.23	54.19
	Mean:					5.96	100.00
	Standard Error:					.33	5.54
	Significant Difference, 20: 1: ...					.99	16.62

This field gave a higher yield than any reaped during the period under review. With only five replicates of each treatment, the standard error is somewhat high, but despite this, P.O.J. 2878 is almost significantly better than D. 625 which it leads by nearly a ton of sucrose in cane per acre. Diamond 10, with high sucrose content and juice purity, is second and leads D. 625 by a wide margin. D. 602/22 and 424/21 also gave encouraging yields. D. 53/27, a cane which sometimes shows great vigour, was very disappointing.

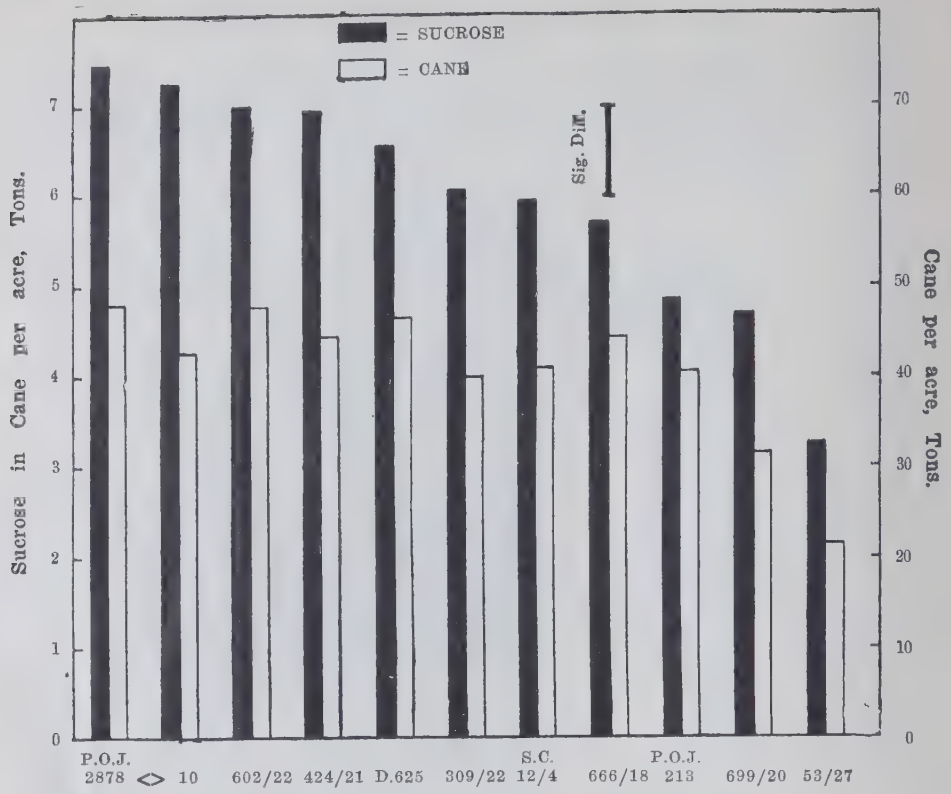

FIG. XVII.

Yields of Sucrose and Cane, per acre, from Field 14 East, Non Pareil (Plant Canes).

PLANTATION PORT MOURANT.

The following trials were reaped :—

TABLE XV.—EXPERIMENTS REAPED AT PLANTATION PORT MOURANT.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of		Type of Layout
			Planting or Previous Reaping	Reaping	Treatments	Replicates	
6 R.	1st Ratoons	12.0	10.IX.31	14.IX.32	6	7	Randomised Blocks
8 A.	Plant Canes	15.7	25.V.31	15.IX.32	12	7	" "

Table XVI gives a comparison between the rainfall received by the experiments and the monthly mean fall for the Estate.

TABLE XVI.—RAINFALL AT PLANTATION PORT MOURANT.

Month	Rainfall 1931-1932 Inches.			Rainfall 1911-1931 Inches.		
June	Plant Canes 108.34 ins.	11.51	1st Ratoons 83.96 ins.	Plant Canes 91.76 ins.	9.21	1st Ratoons 68.94 ins.
July		11.05			8.92	
August		1.82			4.69	
September		2.82			1.99	
October		2.20			2.55	
November		3.79			3.40	
December		5.63			7.95	
January		6.79			6.96	
February		3.79			4.71	
March		7.66			3.32	
April		14.46			4.36	
May		5.73			8.89	
June		13.74			9.21	
July		6.93			8.92	
August		7.69			4.69	
September		2.73			1.99	

As the Table shows, both experiments were favoured with abnormally high rainfall, satisfactorily distributed.

The topsoil of Field 6 R. consists of a markedly acid clay overlying a neutral clay. The organic matter content of the topsoil is below the average. The carbon-nitrogen ratios are narrow. The soluble salt content of the topsoil is above the average, that of the subsoil is normal for this type of subsoil. The theoretical lime requirement of the topsoil is below the average.

The topsoil of Field 8 A. consists of a slightly acid heavy silt overlying a markedly acid clay. The organic matter content of the subsoil is higher than that of the topsoil, possibly due to cultivation before sampling. The carbon-nitrogen ratios are normal. The contents of soluble salts are high. The theoretical lime requirements are low.

TABLE XVII.—RESULTS OF VARIETY TRIALS AT PORT MOURANT.

Estate:	Port Mourant								Port Mourant						
Field:	6 Resource								8 Ankerville						
Age of Cycle:	1st Ratoons								Plants						
Age of Canes:	12 Months								15.7 Months						
Soil:	Topsoil					Subsoil			Topsoil				Subsoil		
	Markedly acid clay					Neutral clay			Slightly acid heavy silt				Markedly acid clay		
Normal pH:	5.73					6.63			5.72				5.64		
Exchange pH:	4.67					6.07			5.05				4.81		
Lime Requirement, Tons:	5.70					1.90			2.10				3.80		
Organic Matter, %:	2.12					0.73			0.98				1.84		
Index of Texture:	50					48			41				51		

	Variety	Cane per Acre (Tons)	Sucrose in Cane (%)	Glucose Ratio	Purity	Sucrose in Cane per Acre (Tons)	Sucrose in Cane per Acre (% Mean)	Combined Results Plants and 1st Ratoons: Variety	Combined Results Plants and 1st Ratoons: Sucrose in Cane per Acre (Tons)
Mean Yields:	B.H.10(12)	37.31	15.55	4.71	90.0	5.80	109.64	D.625	10.63
	D.73/20	37.70	14.51	7.34	87.8	5.47	103.40	B.H.10(12)	10.17
	D.666/18	39.82	13.39	14.59	84.6	5.33	100.76	D.835/18	10.00
	S.C.12(4)	33.54	15.36	2.92	92.8	5.15	97.35	D.73/20	9.93
	D.625	36.57	13.99	13.09	85.8	5.12	96.79	D.666/18	9.78
	D.835/18	35.35	13.86	11.61	82.2	4.90	92.65	S.C.12(4)	9.32
	Mean:					5.29	100.00		
	Standard Error:					.23	4.39		
	Significant Difference, 20: 1:					.70	13.17		

	Variety	Cane per Acre (Tons)	Sucrose in Cane (%)	Glucose Ratio	Purity	Sucrose in Cane per Acre (Tons)	Sucrose in Cane per Acre (% Mean)
	D.625	52.40	13.60	8.32	85.6	7.13	131.55
	D.666/18	55.74	12.39	12.97	81.3	6.90	127.31
	D.602/22	42.48	13.65	7.25	86.6	5.80	107.01
	D.424/21	40.94	13.94	8.56	86.1	5.71	105.35
	D.557/20	46.42	11.78	11.80	85.8	5.47	100.92
	D.835/18	39.31	13.22	15.55	81.7	5.19	95.76
	S.C.12(4)	40.86	12.49	8.08	85.9	5.10	94.09
	D.679/20	32.29	15.81	6.72	88.8	5.10	94.09
	B.H.10(12)	30.05	14.69	8.46	88.2	5.05	93.17
	D.695/13	44.23	11.34	13.79	83.5	5.01	92.44
	D.689/13	43.62	11.47	13.46	78.4	5.00	92.25
	D.571/20	26.35	13.52	8.18	85.4	3.56	65.68
	Mean:					5.42	100.00
	Standard Error:					.34	6.22
	Significant Difference, 20: 1:					1.01	18.66

εεx!!

In Field 6 R., as first ratoons, D. 625 occupied a surpisingly low position whereas B.H. 10 (12), with a good tonnage and excellent juice, headed the list. D. 835/18 also fell away disappointingly. When the results of both crops are taken together, D.625 leads with B. H. 10 (12) second.

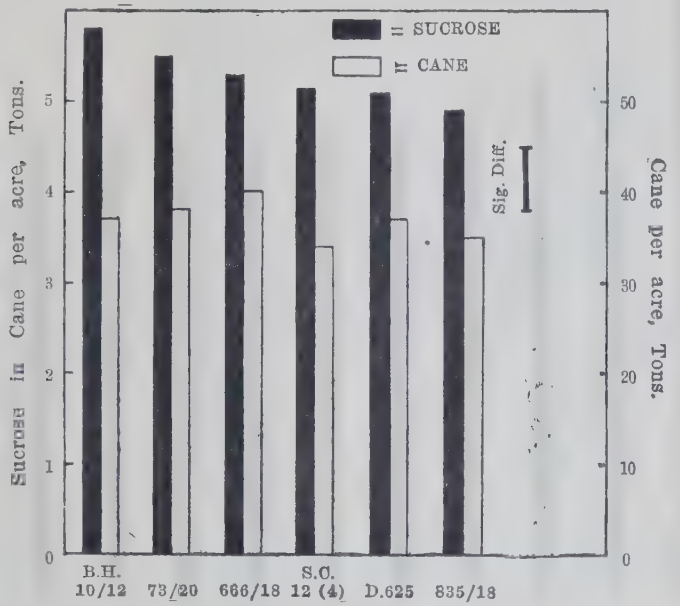

FIG. XVIII.

Yields of Sucrose and Cane, per acre, from Field 6R., Port Mourant (First Ratoons).

In Field 8 A., D. 625 gave a splendid yield and headed the list, closely followed by D. 666/18, both these varieties being significantly better than the others tried. D. 571/20 was exceptionally poor.

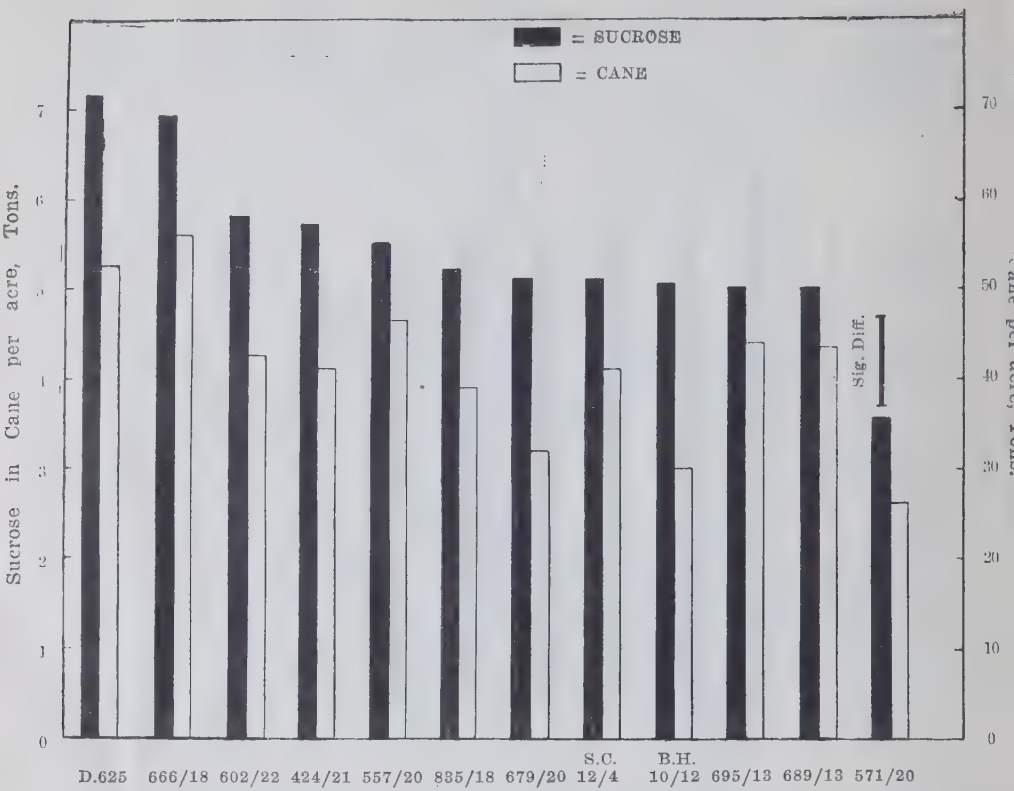

FIG. XIX.

Yields of Sucrose and Cane, per acre, from Field 8A., Port Mourant (Plant Canes).

PLANTATION UITVLUGT.

Two trials were reaped, viz.:

TABLE XVIII.—EXPERIMENTS REAPED AT PLANTATION UITVLUGT.

Field	Age of Cycle	Age of Canes, Months	Date of		Number of		Type of Layout
			Planting or Previous Reaping	Reaping	Treatments	Replicates	
1 W.	1st Ratoons	11.75	15.IX.31	8.IX.32	7	4	Randomised Blocks
10 Z.	Plants	16.3	28.IV.31	7.IX.32	10	7	" "

Table XIX gives a comparison between the rainfall received by the experiments and the monthly mean fall for the Estate.

TABLE XIX.—RAINFALL AT PLANTATION UITVLUGT.

Month	Rainfall 1931-1932 Inches.		Rainfall 1916-1931 Inches.	
May	13.47		13.61	
June	14.16		13.97	
July	14.90		12.10	
August	5.81		7.98	
September	5.28		3.64	
October	7.23		3.99	
November	3.99		7.70	
December	11.48		13.72	
January	10.35		8.74	
February	4.31		4.11	
March	9.24		4.38	
April	20.86		4.91	
May	15.37		13.61	
June	15.52		13.97	
July	9.88		12.10	
August	6.45		7.98	
	Plant Canes 168.30 ins.	1st Ratoons 119.96 ins.	Plant Canes 146.51 ins.	1st Ratoons 98.85 ins.

As will be seen, both trials were adequately watered, the total fall being, in each instance, well above the average.

The topsoil of Field 1 W. is a markedly acid heavy silt overlying a markedly acid heavy silt subsoil. The organic matter content of the topsoil is normal, that of the subsoil is below the average. The carbon-nitrogen ratios are narrow. The contents of soluble salts are above the average. The theoretical lime requirements are below normal,

The topsoil of Field 10 Z. consists of a markedly acid fine silt overlying a markedly acid heavy silt. The organic matter content is below the average. The carbon : nitrogen ratio is narrow. The contents of soluble salts are normal. The theoretical lime requirement is below the average.

TABLE XX.—RESULTS OF VARIETY TRIALS AT UITVLUGT.

| | | |

Field 1 West : The ratoon yields are well above those of the plant canes and clearly demonstrate the invaluable effect of an adequate rainfall well distributed. D. 666/18 which was second in the plant cane trial is first in the ratoon and also first when the results of both crops are considered. The sucrose content of this cane and its juice purity compare favourably, in both instances, with the corresponding figures for D. 625.

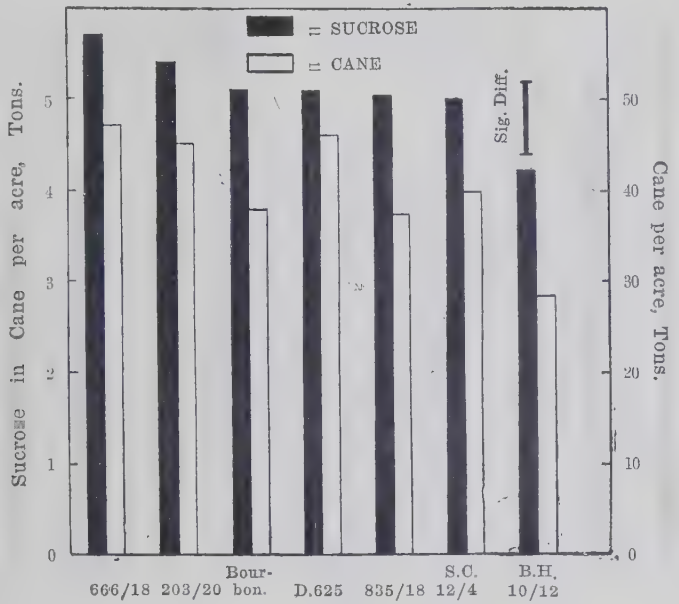

FIG. XX.

Yields of Sucrose and Cane, per acre, from Field 1W., Uitvlugt (First Ratoons).

Field 10 Zeeburg : D. 204/20 leads D.625 by a margin of 12.6 per cent. which is almost statistically significant and shows a higher sucrose content and juice purity than the standard cane. D. 204/20 also gave a good account of itself as a plant cane in a trial at Sophia where, in Field 8 East, it led D. 625 by 0.21 ton sucrose in cane per acre. D. 625 is second of the ten varieties tried in 10 Zeeburg, while D. 666/18 and D. 173/21 tie for third place.

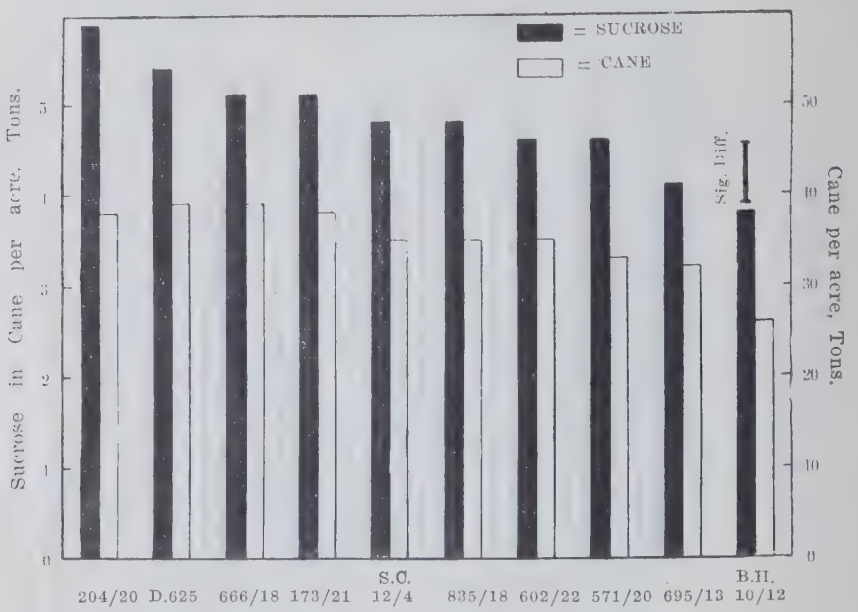

FIG. XXI.

Yields of Sucrose and Cane, per acre, from Field 10Z., Uitvlugt (Plant Canes).

SUMMARY OF RESULTS OF VARIETY TRIALS.

Tables XXI and XXII give, respectively, summaries of the results obtained with the different varieties as plant canes and as first ratoons over a period of two years. Only one second ratoon trial has been reaped, *i.e.*, that in field 13 West, Sophia (*q.v.*).

TABLE XXI.

SUMMARY OF RESULTS OF PLANT CANE EXPERIMENTS FROM ALL STATIONS.

	Variety	Number of Experiments	General Means for					
			Normal Juice		Cane per Acre, Tons	Sucrose in Cane, %	Sucrose in Cane per Acre, Tons	Order of Merit
			Glucose Ratio	Purity				
1	D. 92/17	1	13.61	85.4	51.00	12.92	6.60	1
2	S.W. 3	1	2.17	91.4	40.46	15.95	6.45	1
3	D. 52/20	1	1.10	89.0	40.24	13.08	6.44	2
4	P.O.J. 2878	2	5.61	87.1	42.77	14.25	6.16	1
5	Diamond 10	6	5.42	89.8	38.20	15.68	6.01	2
6	D. 1431/22	1	18.67	83.3	51.56	11.33	5.85	3
7	D. 593/22	1	15.16	85.0	50.00	11.33	5.68	5
8	D. 309/22	2	8.18	86.7	37.87	14.76	5.59	7
9	D. 71/20	1	12.29	85.6	45.80	12.19	5.58	7
10	D. 424/21	4	6.53	88.6	37.31	14.73	5.48	5
11	Diamond 5	1	10.12	87.5	40.86	13.20	5.43	6
12	D. 604/20	1	12.04	86.6	39.78	13.44	5.35	8
13	D. 204/20	2	3.58	90.0	35.28	15.08	5.33	1
13	D. 927/22	2	16.97	81.6	44.12	11.94	5.33	3
13	D. 814/12	2	7.06	87.2	40.92	13.00	5.33	7
14	P.O.J. 1499	1	3.90	87.3	34.02	15.62	5.31	3
15	D. 684/21	2	20.69	77.7	47.51	10.90	5.16	8
16	D. 573/22	1	1.65	90.1	35.96	14.32	5.15	1
17	D. 602/22	9	8.09	87.5	36.66	14.00	5.14	4
18	D. 679/20	1	6.72	88.8	32.29	15.81	5.10	7
19	D. 173/21	1	10.38	87.6	37.77	13.49	5.09	3
20	D. 625	19	11.23	85.1	37.63	13.16	4.96	3
21	P.O.J. 2714	1	6.21	86.6	33.23	14.72	4.89	4
22	D. 666/18	11	10.58	83.8	38.82	12.43	4.84	3
23	D. 403/18	1	5.68	85.5	35.72	13.32	4.76	5
24	D. 663/13	4	9.11	86.7	37.24	12.75	4.74	8
25	D. 744/21	1	3.49	88.6	36.00	13.13	4.73	4
26	P.O.J. 213	2	6.16	85.1	36.70	12.95	4.72	6
27	D. 207/20	1	...	85.4	34.98	13.42	4.69	1
28	D. 53/27	2	9.35	85.7	30.88	15.06	4.65	5
29	D. 835/18	8	8.26	86.3	34.02	13.31	4.56	4
30	D. 1221/22	1	14.54	84.5	41.50	10.93	4.54	9
31	D. 895/22	1	...	84.4	36.05	12.51	4.51	2
32	D. 1034/22	1	4.79	88.5	33.18	13.27	4.40	4
33	D. 1034/21	1	4.10	90.5	30.78	14.06	4.33	5
33	D. 118/02	1	9.43	88.8	29.27	14.46	4.33	11
34	D. 557/20	7	6.03	87.5	32.94	13.08	4.31	6
34	D. 376/17	1	3.77	90.3	31.76	13.56	4.31	6
35	D. 447/17	1	8.02	87.2	30.65	14.03	4.29	2
36	D. 699/20	3	5.80	86.6	30.73	14.59	4.27	6
37	D. 695/13	5	7.32	87.4	32.47	13.00	4.20	6
37	B. 74	1	5.66	87.3	29.80	14.11	4.20	9
38	D. 351/20	5	4.85	88.6	30.56	13.63	4.19	4
39	D. 6/21	2	31.62	73.0	41.18	9.89	4.08	6
40	S.C. 12 (4)	13	4.86	87.7	30.88	13.03	4.06	7
41	D. 383/22	1	4.72	87.9	36.02	11.23	4.05	7
42	D. 571/20	3	4.67	89.4	29.58	13.59	4.02	9
43	I.C.T.A. 36	1	9.12	82.6	30.73	13.06	4.01	10
44	P.O.J. 2727	2	7.59	86.2	29.92	13.04	3.98	6
44	D. 893/21	1	5.75	85.3	38.16	10.44	3.98	8
45	D. 241/21	1	5.61	86.5	30.41	13.01	3.96	4
46	D. 789/18	1	3.70	89.5	27.67	14.11	3.91	7
47	D. 238/17	1	4.08	89.4	30.41	12.79	3.89	8
48	Diamond 17	1	11.51	83.0	32.63	11.81	3.84	4
49	D. 620/21	1	13.30	85.3	31.29	12.23	3.82	10
50	D. 203/20	2	9.73	81.8	34.07	11.40	3.77	5
51	D. 918/22	2	15.23	80.0	31.59	11.72	3.75	10
52	D. 75/20	1	8.69	86.5	30.74	12.17	3.74	10
53	D. 31/17	1	9.37	84.2	27.53	13.38	3.71	4
54	B.H. 10 (12)	10	5.00	88.8	26.39	13.65	3.68	6
55	D. 689/13	3	8.32	82.4	30.75	11.93	3.64	9
56	D. 1175/22	1	...	82.1	32.42	11.18	3.63	9
57	D. 613/21	2	6.49	88.6	27.06	12.65	3.43	11
58	D. 73/20	3	4.91	87.2	25.07	13.34	3.37	5
59	Bourbon	2	9.55	83.4	26.17	12.27	3.22	8
60	D. 628/20	1	5.59	87.7	23.47	12.89	3.02	7
61	P.O.J. 2725	1	3.66	86.2	21.31	12.35	2.63	6

TABLE XXII.

SUMMARY OF RESULTS OF 1ST RATOON EXPERIMENTS FROM ALL STATIONS.

	Variety	Number of Experiments	General Means for					
			Normal Juice		Cane per acre, Tons	Sucrose in Cane, %	Sucrose in Cane per acre, Tons.	Order of Merit
			Glucose Ratio	Purity				
1	Diamond 10	2	8.32	90.0	35.83	14.62	5.61	1
2	D. 203/20	1	15.40	85.3	44.89	12.02	5.39	2
3	D. 663/13	1	13.20	88.5	37.37	14.13	5.24	6
4	D. 684/21	1	23.27	82.2	43.05	12.04	5.20	7
5	D. 814/12	1	8.25	88.7	36.65	14.03	5.13	10
6	D. 666/18	6	15.49	82.9	36.49	12.85	4.69	3
7	Bourbon	2	13.73	87.7	33.41	13.83	4.61	6
8	D. 625	8	14.92	84.8	31.60	13.36	4.15	3
9	S. C. 12 (4)	8	5.16	90.4	28.64	13.85	4.05	5
10	D. 73/20	3	10.33	86.7	28.59	13.33	3.85	5
11	D. 835/18	6	11.39	85.5	28.65	13.14	3.84	7
12	B. H. 10 (12)	7	4.71	90.4	24.46	15.21	3.76	6
13	Diamond 17	1	11.28	80.6	28.99	12.70	3.68	3
14	D. 628/20	1	11.61	88.4	22.84	15.32	3.50	5
15	P. O. J. 2727	2	4.49	87.1	22.72	13.66	3.14	2
16	P. O. J. 2725	2	3.73	88.7	22.11	13.85	3.11	2
17	D. 557/20	3	7.38	86.3	23.97	12.43	3.01	5
17	D. 695/13	2	5.31	87.5	22.64	13.34	3.01	3
18	D. 351/20	4	8.92	87.5	27.60	13.74	2.75	7
19	D. 447/17	1	6.86	88.3	16.96	16.15	2.74	4
20	D. 689/13	2	12.67	81.3	23.28	11.32	2.61	6
21	D. 31/17	1	14.85	85.1	16.21	15.12	2.45	7

In considering the above Tables, attention must be given to the columns for number of experiments and general mean order of merit, for it is unwise to jump to definite conclusions from the results of one or two trials and, on the other hand, it must be borne in mind that the varieties are placed in order of yield of sucrose in cane per acre, but since such yields depend not only on the variety but also on the estate, field and year of experimentation, the mean order of merit held by a variety in the experiments in which it occurred is also of major importance in assessing its value.

This Colony is in the fortunate position of possessing a standard variety which gives satisfactory if not ideal yields on perhaps 80 per cent., and which probably covers 90 per cent. of the area devoted to cane cultivation. The yields appear to be on a definite upward trend both as regards total output and output per acre. In such circumstances it would be most unwise to counsel the replacement of the standard cane, D. 625, by any other, on a large scale, unless that other variety has been thoroughly proven by a number of tests extending over a few years at several points in the Colony and including experiments on both plants and ratoons.

However, yields in British Guiana are not yet up to the standard reached by some of the leading cane-growing countries, and it is felt, in so far as varieties are

concerned, that where there is a good there can be a better, and that, in any case, there should be a second cane ready to replace D. 625 should its yields show signs of falling off. It was for these reasons that this series of trials was initiated in 1930 (see *The Agricultural Journal of British Guiana*, IV, pp. 189-194 and 198-204) and it is gratifying to note that, so far as can be judged from two seasons' work, there appear to be few canes in the Colony which rival D. 625.

The variety Diamond 10 has shown up well in all the trials. Six plant cane trials have been reaped, and on a basis of these it is well above D. 625 in the summary list, while its average place in the experiments was second as compared with third for D. 625. Diamond 10, as will be seen, shows a mean sucrose in cane more than two per cent above D. 625 and a purity nearly five points higher. As ratoons, so far, this cane is also well ahead of D. 625 in every respect. The variety is grown on a commercial scale on the East Bank of Demerara River, and it is understood that the estate authorities are very satisfied with some 2,500 acres reaped last year. Reports on numerous nurseries established throughout the Colony are also, for the most part, good.

P.O.J. 2878, the famous Java cane, has only been reaped in two plant cane experiments so far; however it was very satisfactory. Observations on the Station and numerous reports from outlying districts point to this cane as a vigorous grower both as plants and ratoons.

D. 666/18, as a result of eleven experiments, finds itself slightly under D. 625 as a plant cane and, as a result of six experiments well above it as a first ratoon. Its order of merit in its experiments is the same as that of D. 625 both as plants and ratoons. In both instances, however, the sucrose content of the cane and the purity of the juice were inferior to the corresponding figures for D. 625.

Most estates are trying these three canes in small areas among their commercial plantings. The experimental results, so far, confirm the wisdom of this and those estates which have been hesitating would be well advised to make a start for, although subsequent results *may* not confirm these early findings, it is quite possible that they may, and if an early start is made in the matter of nurseries and extension, the change over will be all the more easily and rapidly affected when a more definite pronouncement can be made.

These early trials will enable a great deal of sorting out to be done among the large number of older seedlings which have accumulated. Thus, while such canes as D. 1221/22, D. 571/20, D.75/20, D. 31/17, D. 73/20, D. 628/20, and numerous others, can be dropped out of the trials, it is obvious that in D. 92/17, S.W.3, D. 52/20, D. 1431/22, D. 204/20, D. 927/22, D.573/22, D. 207/20 and D. 895/22, we have canes of considerable promise which are deserving of further trial.

MANURIAL TRIALS.

This section deals with the results of manurial experiments with sugar cane. The majority of the trials have been reaped as plant canes, for the first time during the period under review.

In this report, no attempt has been made to fit economic conclusions to the data obtained, although this aspect has, of course, been borne in mind during the design of the experiments. Given the results of field experiments, any planter, knowing the costs of fertilisers and the value of sugar, can decide the optimum rate of application of various fertilisers. The report, therefore, furnishes information on the effect of fertilisers on sucrose production.

The results are considered under various fertiliser headings such as nitrogen, lime-bearing materials, phosphate and potash. A number of the trials are of a complex nature and involve graded dressings of two or more fertilisers. It will be found, therefore, that some experiments are discusssed under two or more headings; thus the results of graded dressings of sulphate of ammonia in an experiment will appear under one heading while the effects of graded limestone dressings in the same experiment will be discussed under another heading. Any interaction which has been established between two fertilisers will be noted.

Previous work in this Colony (Harrison, Stockdale and Ward, *W. I. B.*, 1913, Vol. XIII, p. 177), indicated that fertilisers, if applied at the correct time, had no effect upon the sucrose quality of the cane. It has not been possible, with the facilities available, to examine samples of cane from individual plots of every experiment. Most of the experiments, however, have been examined in this manner, and the results obtained are not, in some cases, in accord with the work of previous investigators.

The cane soils of the Colony consist generally of two types which have received some description in the Annual Report of the Chemical Division, Department of Agriculture, 1931, namely :—

(1) *The Front Land Type*, consisting of an acid topsoil, low in soluble salt content, and a less acid, heavier subsoil, often containing appreciable quantities of soluble salts. This soil type may vary in texture from a heavy loam (index of texture 25) to a clay (index of texture 55);

(2) *The Pegasse Type*, consisting of a highly acid topsoil, possessing considerable quantities of organic matter, of wide carbon/nitrogen ratio and a highly acid clay subsoil. Usually both topsoil and subsoil contain very small amounts of soluble salts. The organic matter content of this soil type varies considerably. In some areas, the topsoil has been mixed with the clay subsoil, while in other

areas, the organic matter has disappeared in the fires which precede reaping operations in this Colony. It is considered that when the layer of pegasse disappears, a soil similar in properties to the coastal clay soil type materialises. This is not the case. The characteristics and manurial requirements of the resulting soil differ considerably from those of the front land soil type.

Roughly seventy-five per cent. of the Colony's cane cultivation occurs on the more fertile front land type, and previous manurial experiments (Harrison, Stockdale and Ward, *loc. cit.*) have been confined to this type. This report includes the plant cane results of the first suitably designed manurial experiments carried out on the pegasse soil type.

The results of experiments which have given statistically significant differences are reproduced in graphical form.

The calendar of agricultural operations for each experiment appears in Appendix I.

(A) Experiments with Graded Dressings of Nitrogenous Manures.

(*A1*) *Sulphate of Ammonia on Flooded Front Land Clay* (*Pln. Port Mourant*).

This experiment involves graded dressings of sulphate of ammonia and of pulverised limestone, in all combinations. The results for the different ground limestone dressings alone are considered in section (B).

Composite samples of the topsoil and the subsoil of the experimental area were examined in the laboratory ; the results appear in Appendix II.

The topsoil is a markedly acidic clay overlying an acidic clay subsoil. It is well supplied with organic matter, with a normal carbon/nitrogen ratio. The subsoil contains a considerable amount of soluble salts. The theoretical lime requirement is low. The basic dressing of 3 cwt. per acre of superphosphate of lime, which forms part of the estate routine, probably had a beneficial effect on cane growth.

The monthly rainfall during the growth period, and the mean monthly rainfall for the area for 21 years, are shown in Table XXIII.

TABLE XXIII.

Month.	Rainfall, inches. 1911-1931	1930-1932 Excess or deficit.
December	7.95	— 3.18
January	6.96	+ 1.00
February	4.71	+ 2.05
March	3.32	— 0.45
April	4.36	— 1.48
May	8.89	+11.25
June	9.21	+ 2.30
July	8.92	+ 2.13
August	4.69	— 2.87
September	1.99	+ 0.83
October	2.55	— 0.35
November	3.40	+ 0.39
December	7.95	— 2.32
January	6.96	— 0.17
February	4.71	— 0.92
Total	86.57	+ 8.21

The results obtained appear in Table XXIV, and are also shown graphically in Figure XXII.

TABLE XXIV.

Sulphate of Ammonia, Rate per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent of mean.
6 cwt.	51.37	6.54	101.4
4 cwt.	53.29	6.79	105.2
2 cwt.	53.35	6.80	105.3
Nil	44.61	5.69	88.1
Means	50.65	6.45	100.0
S. E. of means	2.117	0.269	4.17
Significant Differences	6.10	0.779	12.04

The " Z " value for the effect of nitrogen on weight of cane is.....0.6691
For P=0.05 the required " Z " value is.....0.5362

NOTE: A difference between the results of the various treatments, greater than the significant difference, would occur by the chance only five times in every hundred similar trials. The significant difference in this and other trials is obtained by multiplying the standard error of the difference of two means by the appropriate value of 't' found in Fisher's Table.

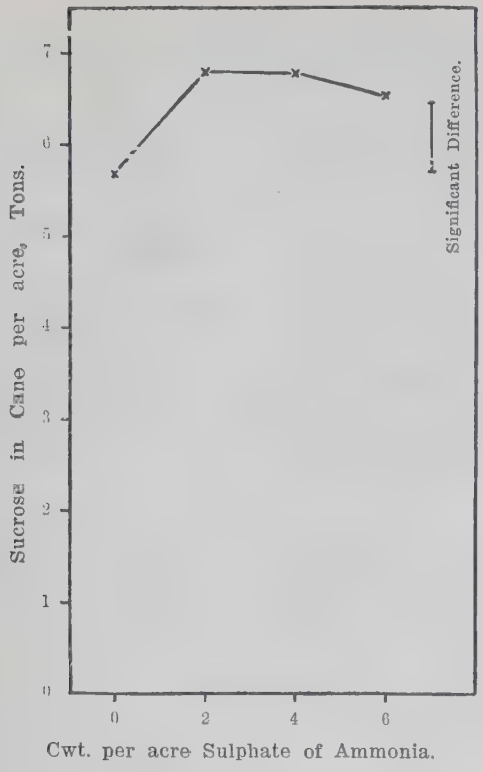

FIG. XXII.

Effect of Sulphate of Ammonia on Flooded Front Land Clay (Plant Canes).

The dressings of nitrogen have therefore had a definite effect on the weight of cane. Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results indicates that the various treatments have had no effect on the juice purity nor on the value for the percentage of sucrose in cane. Values for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (12.74%) in order to obtain values for the tons of sucrose per acre. It was not possible to determine the glucose content of every sample. One sample from each treatment has, however, been examined.

The general mean analytical figures for the experiment are :—

Purity	86.96
Glucose Ratio	5.90
Percentage of Sucrose in the Cane	12.74

Conclusions: Under the conditions of this experiment:—

(a) Dressings of sulphate of ammonia produce increases in the plant cane crop on flood fallowed clay soils;

(b) Yields obtained with dressings of 4 cwt. per acre and 6 cwt. per acre of sulphate of ammonia do not differ significantly from those obtained with dressings at the rate of 2 cwt. per acre;

(c) No interaction between the various dressings of sulphate of ammonia and of ground limestone has been established.

(*A2*) *Sulphate of Ammonia and other Nitrogenous Fertilisers on Unflooded Front Land Fine Silt (Sophia Experiment Station).*

This experiment involves graded dressings of sulphate of ammonia and dressings of two organic nitrogenous manures, namely, Kerazotine and Leather-meal. The results for the plant cane crop were published in *The Agricultural Journal of British Guiana*, IV, pp. 10-17.

From the results of the soil survey of Sophia Experiment Station, it appears that the soil of the area is a markedly acidic fine silt, overlying a similar subsoil. The area is generally deficient in available phosphate. Analytical figures appear in Appendix II. The monthly rainfall during the growth period is compared with the mean monthly rainfall for the area for preceding years in Table XXV.

TABLE XXV.

Month.	Rainfall, inches. 1921-1931	1931-1932 Excess or deficit.
March	3.73	— 1.56
April	4.12	— 2.89
May	11.67	— 0.01
June	14.65	— 2.06
July	11.14	+ 1.62
August	8.36	— 1.39
September	3.07	— 0.01
October	3.92	+ 2.76
November	6.25	— 4.38
December	14.25	— 5.26
January	7.11	+ 1.81
February	3.75	— 2.63
Total	92.02	—14.00

The yields obtained with the first ratoon crop are shown in Table XXVI. and are graphically represented in Figure XXIII.

TABLE XXVI.

Fertiliser.	Nitrogen, lb. per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent of mean.
Sulphate of Ammonia	120	22.27	3.02	121.0
" " "	80	21.87	2.96	118.6
" " "	40	17.90	2.42	97.3
Kerazotine	40	14.13	1.91	76.8
Leathermeal	40	15.81	2.14	85.9
Means	...	18.40	2.49	100.0
S.E. of means	...	1.031	0.140	5.60
Significant Differences	...	3.36	0.455	18.26

"Z" value obtained for effect of treatment on yield of cane .....=1.253
"Z" value required for P=0.01 .....=0.8443

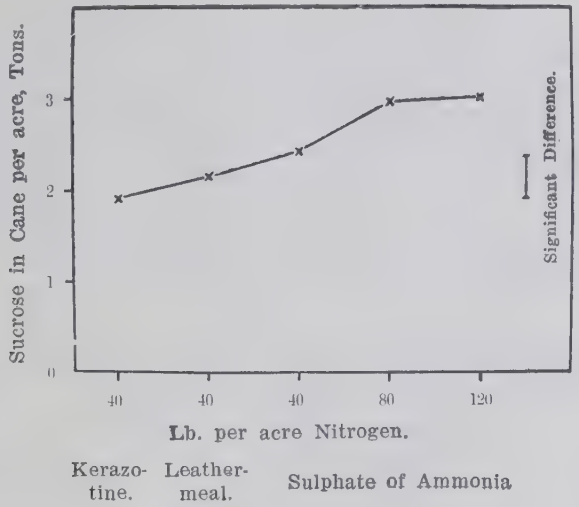

FIG. XXIII.

Effect of Nitrogenous Manures on Unflooded Front Land Fine Silt (First Ratoons).

The yields of the plant cane crop, previously reported in the *Agricultural Journal*, were given as sugar per acre. Experimental results of the Department are now reported as sucrose per acre. The plant cane results have been recalculated to this basis and the combined figures for plants and first ratoon appear in in Table XXVII.

TABLE XXVII.

Fertiliser.	Nitrogen, lb. per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent of mean.
Sulphate of Ammonia	210	49.94	6.69	114.6
" " "	155	48.53	6.50	111.3
" " "	100	43.24	5.78	99.2
Kerazotine	100	37.80	5.00	86.7
Leathermeal	100	38.46	5.14	88.2
Means	...	43.59	5.83	100.0

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the figures for juice purity, and for the percentage of sucrose in cane, indicates that the various dressings have had no effect upon the quality of the cane. The values for the tons of cane per acre have consequently been multiplied by the general mean value for the sucrose percentage in cane (13.54%) to obtain the values for the tons sucrose per acre.

It was not found possible to investigate the glucose content of these samples.

The general mean analytical figures for the experiment are :—

Purity	...	...	92.10
Percentage of Sucrose in the cane	...		13.54

The prices of the organic materials used in the experiment were :—

Kerazotine $75 per ton (1929) c.i.f.
Leathermeal $47 per ton (1929) c.i.f.

Conclusions (First ratoon crop): Under the conditions of the experiment :—

(a) The yield obtained with 40 lbs. per acre of nitrogen as Kerazotine does not differ from that obtained with 40 lbs. per acre of nitrogen as Leathermeal;

(b) 40 lbs. of nitrogen as sulphate of ammonia gives a definitely better yield than an equal dressing of nitrogen derived from Kerazotine. The yield does not differ, however, from that obtained with an equivalent amount of nitrogen derived from Leathermeal;

(c) A dressing of 80 lbs. of nitrogen per acre as sulphate of ammonia gives a definitely higher yield than does a dressing of 40 lbs. of nitrogen per acre from any source.

(d) A dressing of 120 lbs. of nitrogen per acre as sulphate of ammonia does not give a definitely increased yield over that obtained with a dressing of 80 lbs. of nitrogen per acre as sulphate of ammonia ;

(e) The various dressings have had no measurable effect upon the juice purity or upon the sucrose quality of the cane.

(*A3*) *Sulphate of Ammonia and other Nitrogenous Fertilisers on Unflooded Front Land Heavy Silt* (*Pln. Blairmont*).

As in the case of experiment (*A2*) this trial involves graded dressings of sulphate of ammonia and a dressing of Kerazotine. In the plant cane trial, reported in the *Agricultural Journal of British Guiana*, IV, 2, pp. 59—63, one treatment consisted of sufficient Leathermeal to give a dressing of 40 lbs. of nitrogen per acre. No Leathermeal was available for the repetition of this dose to the first ratoons, a dressing of 40 lbs. of nitrogen per acre as sulphate of ammonia has consequently been substituted.

Composite samples of the topsoil and subsoil of the experimental area were examined in the laboratory. The results appear in the discussion of the plant cane figures, but are included in Appendix II. for the sake of completeness.

The topsoil is a highly acidic heavy silt, overlying a highly acidic fine silt. It contains a fair amount of organic matter of a normal carbon/nitrogen ratio. The soil contains an average amount of soluble salts. The theoretical lime requirement is high.

The monthly rainfall during the growth period is compared in Table XXVIII. with the mean monthly rainfall for the area during preceding years.

TABLE XXVIII.

Month.	Rainfall, inches. 1911-1921	1931-1932 Excess or deficit.
April	5.19	+0.94
May	10.52	+4.82
June	12.28	—0.31
July	10.36	—1.51
August	6.41	—3.39
September	2.24	+3.19
October	2.53	—0.86
November	3.71	+0.56
December	9.55	—1.96
January	9.00	—3.18
February	4.86	—0.05
March	4.33	+6.52
Total	80.98	+4.77

The results obtained appear in Table XXIX.

TABLE XXIX.

Fertiliser.	Nitrogen, Lb. per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent of mean.
Sulphate of Ammonia (1)	120	21.79	2.88	101.0
" " " (2)	120	21.74	2.75	100.7
" " "	80	22.78	3.01	105.6
" " "	40	23.38	3.09	108.4
" " " *	40	22.44	2.96	103.9
Kerazotine	40	20.81	2.87	96.5
Control	nil	17.99	2.38	83.5
Means	—	21.56	2.84	100.0
S. E. of means	—	0.99	0.131	4.6
Significant Differences	—	2.99	0.395	13.9

The "Z" value for the effect of treatments on yield of cane is.....0.3140
For P = 0.05, the required "Z" value is.....0.4420

The effect of the various dressings on the yield of sucrose is, therefore, *not* statistically significant.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results indicates that the various treatments have not had effect upon the percentage of sucrose in cane. Figures for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (13.21%) in order to obtain values for the tons of sucrose per acre.

Further statistical examination shows that the various treatments have had a measurable effect both on the juice purity and on the glucose ratio. These effects are considered in detail in Table XXX.

(1) In one dose.

(2) In two doses.

* Substituted for the original dressing of Leathermeal.

TABLE XXX.

Fertiliser.		Nitrogen Lb. per acre.	Juice Purity. Actual.	Juice Purity. Per cent.	Glucose Ratio. Actual.	Glucose Ratio. Per cent.
Sulphate of Ammonia	(1)	120	85.3	97.7	13.85	119.8
„ „ „	(2)	120	84.1	96.3	15.81	136.8
„ „ „		80	86.1	98.6	13.27	114.8
„ „ „		40	89.4	102.4	10.36	89.6
„ „ „ *		40	88.4	101.3	9.28	80.3
Kerazotine		40	88.0	100.8	10.33	89.4
Control		nil	89.9	103.0	8.01	69.3
Means		—	87.3	100.0	11.56	100.0
S. E. of means		—	0.095	0.109	1.023	0.885
Significant Differences		—	0.291	0.333	3.12	2.70

"Z" value for the effect of treatment on juice purity.....=0.8273
"Z" value for the effect of treatment on glucose ratio .....=1.0057
"Z" value for P=0.01.....=0.6226

Conclusions: Under the prevailing experimental conditions :—

(a) The various treatments of sulphate of ammonia and Kerazotine had no definite effect on the yield of sucrose in the first ratoon crop ;

(b) The juice purity showed a definite diminution with increasing doses of nitrogen ;

(c) The glucose ratio showed a definite increase with increasing doses of nitrogen.

The various treatments have had a definite effect upon the juice purity and glucose ratio of the *plant* canes. The results are shown in Table XXXI.

(1) In one dose.

(2) In two doses.

* Substituted for the original dressing of Leathermeal.

TABLE XXXI.

Fertiliser.		Nitrogen, Lb. per acre.	Juice Purity. Actual.	Juice Purity. Per cent.	Glucose Ratio. Actual.	Glucose Ratio. Per cent.
Sulphate of Ammonia	(1)	120	90.26	100.6	10.66	103.1
" " "	(2)	120	87.19	96.9	12.83	124.1
" " "		80	89.62	99.6	11.23	108.6
" " "		40	90.44	100.5	10.52	101.7
Leathermeal		40	91.36	101.5	8.64	83.6
Kerazotine		40	91.01	101.1	9.67	93.5
Control		nil	89.94	99.9	8.82	85.3
Means		—	90.02	100.0	10.34	100.0
S. E. of means		—	0.649	0.721	0.819	7.92
Significant Differences		—	1.97	2.19	2.52	24.4

"Z" value obtained for effect of treatment on juice purity.....=0.7545
"Z" value obtained for effect of treatment on glucose ratio .....=0.561
"Z" value required for P=0.05 .....=0.4420
"Z" value required for P=0.01 .....=0.6226

Reference to the analytical figures for the soil samples collected from this area shows that the amount of exchangeable potash present is low. It is possible that, had a basic dressing of potassic manures been applied to the whole area, the heavier dressings of nitrogen would have been without effect upon the juice purity and glucose ratio, and that the variation between the yields of individual plots in the first ratoons would have been reduced.

(A4) *Sulphate of Ammonia on Unflooded Front Land Clay (Sophia Experiment Station).*

This experiment involves graded dressings of sulphate of ammonia and liberal dressings of ground limestone, sulphate of potash, superphosphate of lime and ground rock phosphate applied in all combinations. The aim of the experiment is to investigate the effect of varied dressings of nitrogen in the presence or absence of other fertilisers. Heavy dressings of the other manures have been employed in order to ensure the presence of a sufficiency. The effect of these other manures will be described under their appropriate headings, and any definite interactions will be noted.

Composite soil samples of the topsoil and subsoil of the experimental area were examined in the laboratory; the results appear in Appendix II.

The topsoil is a markedly acidic clay, overlying a slightly acidic clay. It contains an average amount of organic matter, of typical carbon/nitrogen ratio. The

(1) In one dose.
(2) In two doses.

topsoil contains a fair amount of soluble salts, the amount in the subsoil is considerable. The theoretical lime requirement is low.

The monthly rainfall for the plant cane cycle and for the first ratoon cycle is compared in Table XXXII with the mean monthly rainfall of the area for preceding years.

TABLE XXXII.

Month.	Rainfall, inches. 1921-1931	1930-1931 Excess or deficit.	Month	Rainfall, inches. 1921-1931	1931-1932 Excess or deficit.
May	11.67	+ 2.22	October	3.92	+ 2.76
June	14.65	— 1.69	November	6.25	— 4.38
July	11.14	+11.62	December	14.25	— 5.26
August	8.36	— 2.17	January	7.11	+ 1.81
September	3.07	— 2.08	February	3.75	— 2.63
October	3.92	— 2.55	March	3.73	+ 2.84
November	6.25	— 4.65	April	4.12	+11.19
December	14.25	— 5.31	May	11.67	+ 1.66
January	7.11	— 4.98	June	14.65	+ 0.29
February	3.75	— 0.17	July	11.14	— 4.04
March	3.73	— 1.56	August	8.36	— 1.52
April	4.12	— 2.89	September	3.07	— 2.62
May	11.67	— 0.01			
June	14.65	— 2.06	Total	92.02	+ 0.10
July	11.14	+ 1.62			
August	8.36	— 1.39			
September	3.07	— 0.01			
Total	140.91	—16.06			

The *plant cane* yields are shown in Table XXXIII and are graphically represented in Figure XXIV.

TABLE XXXIII.

Fertiliser.	Rate per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent of mean.
Sulphate of Ammonia	5.10 cwt.	18.06	2.22	111.9
„ „ „	3.40 cwt.	16.29	2.01	100.9
„ „ „	1.70 cwt.	15.62	1.92	96.8
Control	nil	14.57	1.79	90.3
Means	—	16.14	1.99	100.0
S. E. of means	—	0.573	0.07	3.55
Significant Differences	—	1.66	0.204	10.3

The " Z " value for the effect of nitrogenous dressings on the yield is.....0.9402
For P = 0.01, the required value of " Z " is.....0.7086

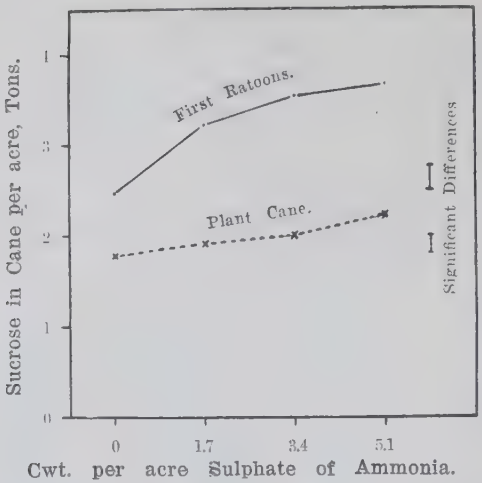

FIG. XXIV.

Effect of Sulphate of Ammonia on Unflooded Front Land Clay (Plant Canes and First Ratoons).

The effect of the dressings of sulphate of ammonia on the plant cane yields is therefore highly significant.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results shows that the varied dressings of sulphate of ammonia have had no effect on the juice purity, the glucose ratio, or the percentage of sucrose in the cane. The figures for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (12.33%) in order to obtain values for the tons of sucrose per acre.

The general mean analytical figures for the plant cane crop are :

Purity	83.65
Glucose Ratio	6.06
Percentage of Sucrose in the cane	12.33

No definite interactions have been noted between the varied nitrogen dressings and the other manures applied.

Conclusions (Plant Cane Crop) : Under the prevailing conditions of the experiment:—

(a) Dressings of sulphate of ammonia increase the weight of cane per acre, but are without measurable effect upon the sucrose content of the cane, the juice purity, or the glucose ratio ;

(b) A dressing of 1.70 cwt. per acre of sulphate of ammonia does not give a definite increase in cane weight ;

(c) A dressing of 3.40 cwt. per acre of sulphate of ammonia gives a significant increase in yield over the control plots, but its effect is not measurably superior to that obtained with a dressing of 1.70 cwt. per acre of sulphate of ammonia ;

(d) A dressing of 5.10 cwt. per acre of sulphate of ammonia gives a significant increase in yield over that obtained with the other rates of application.

The yield figures for the *first ratoon crop* are shown in TABLE XXXIV. and are also represented in Figure XXIV.

TABLE XXXIV.

Sulphate of Ammonia, Cwt. per acre.	Cane, Tons per acre.		Sucrose in Cane, per cent.		Sucrose, Tons per acre.	
	Actual.	Per cent.	Actual.	Per cent.	Actual.	Per cent.
5.10 cwt.	25.69	117.7	14.29	96.2	3.67	113.3
3.40 cwt.	24.22	111.0	14.66	98.7	3.55	109.6
1.70 cwt.	21.30	97.6	15.18	102.2	3.23	99.7
nil	16.18	74.1	15.28	102.9	2.47	76.2
Means	21.82	100.0	14.85	100.0	3.24	100.0
S. E. of means	0.655	3.00	0.131	0.88	0.097	3.00
Sig. Differences	1.89	8.66	0.378	2.55	0.281	8.66

"Z" value obtained for the effect of nitrogen on weight of cane=1.8570
"Z" value obtained for the effect of nitrogen on percentage of sucrose in cane.....=2.1209
"Z" value required for P=0.01.....=0.7086

The results obtained for the weight of cane indicate that a definite interaction between the various dressings of sulphate of ammonia and of ground limestone exists. The figures representing tons of sucrose per area appear in Table XXXV. and in Figure XXV.

TABLE XXXV.

Sulphate of Ammonia, Cwt. per acre.	Ground limestone, Tons per acre.		Mean
	nil	10 tons.	
nil	1.88	3.06	2.47
1.70 cwt.	2.88	3.59	3.23
3.40 cwt.	3.45	3.65	3.55
5.10 cwt.	3.79	3.55	3.67
Means	3.02	3.47	3.24
S. E. of mean		0.138	
Significant Difference		0.397	

"Z" value obtained for effect of interaction of nitrogen and limestone on the yield of cane.....=1.1327
"Z" value required for P=0.01.....=0.7086

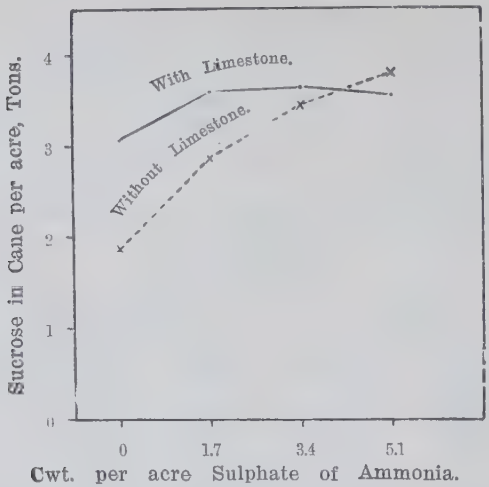

FIG. XXV.

Effect of Sulphate of Ammonia on Unflooded Front Land Clay in presence and absence of Ground Limestone (First Ratoons).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results indicates that dressings of sulphate of ammonia have had a definite effect on the percentage of sucrose in the cane. The results are shown in Table XXIV, and in this table the figures for the tons of cane per acre have been multiplied by the appropriate percentages of sucrose in order to obtain values for the sucrose per acre.

Further statistical analysis shows that dressings of sulphate of ammonia have affected the juice purity and the glucose ratio. The results appear in Table XXXVI.

TABLE XXXVI.

Fertiliser.	Rate per acre.	Juice Purity.		Glucose Ratio.	
		Actual.	Per cent of mean.	Actual.	Per cent of mean.
Sulphate of Ammonia	5.10 cwt.	86.14	98.5	11.79	122.6
„ „ „	3.40 cwt.	87.04	99.5	10.28	106.9
„ „ „	1.70 cwt.	88.44	101.1	8.31	86.4
Control	nil	88.26	100.9	8.10	84.2
Means	—	87.47	100.0	9.62	100.0
S.E. of means	—	0.260	0.297	0.372	3.87
Significant Differences	—	0.750	0.857	1.087	11.30

"Z" value obtained for effect of nitrogen on juice purity.....=1.4204
"Z" value obtained for effect of nitrogen on glucose ratio.....=1.5354
"Z" value required for P=0.01.....=0.7086

Conclusions (First ratoon crop) : Under the prevailing conditions of the experiment :—

(a) Dressings of sulphate of ammonia increase the yield of sugar, the weight of cane, and the value for the glucose ratio. They decrease the values for the percentage of sucrose in the cane, and for the juice purity ;

(b) A dressing of sulphate of ammonia, at the rate of 1.7 cwt. per acre (40 lbs. nitrogen) increases the yield of sucrose and the weight of cane, but has no measurable effect upon the percentage of sucrose in the cane, upon the juice purity, nor upon the glucose ratio ;

(c) A dressing of sulphate of ammonia, at the rate of 3.4 cwts. per acre (80 lbs. nitrogen) in comparison with a dressing at the rate of 1.7 cwts. per acre, increases the yield of sucrose, the weight of cane and the value for the glucose ratio. It decreases the percentage of sucrose in the cane and the value for the juice purity ;

(d) A dressing of sulphate of ammonia, at the rate of 5.1 cwt. per acre (120 lb. nitrogen) in comparison with a dressing at the rate of 3.4 cwt. per acre, does not increase the yield of sucrose, nor the weight of cane, but increases the glucose ratio. It does not decrease the percentage of sucrose in the cane, but decreases the purity of the juice ;

(e) The dressings of potassic and phosphatic manures applied to the plant cane show no definite effects of interaction with the sulphate of ammonia applied to the first ratoons ;

(f) The dressing of ground limestone applied to the plant canes shows a definite interaction with sulphate of ammonia in connection with the weight of cane obtained in the first ratoon crop ;

(g) In the absence of ground limestone, the initial yield (without fertiliser) is low, but increases rapidly with single and double dressings of sulphate of ammonia, the treble dressing gives no further definite increase in yield ;

(h) In the presence of ground limestone, the initial yield (without sulphate of ammonia) is considerably higher than that obtained in the absence of ground limestone. The single dressing of sulphate of ammonia gives a definite increase in yield, but the double and treble dressings give no further definite response.

(*A5*) *Sulphate of Ammonia on Pegassy Clay* (*Pln. Farm*).

The experiment involves graded dressings of sulphate of ammonia and of pulverised limestone in all combinations. A few treatments of sulphate of potash are included. The size of the experimental area did not permit of the inclusion of potash manure at all levels of the other fertilisers.

Composite samples of the topsoil and subsoil of the experimental area were examined in the laboratory and the results appear in Appendix II.

The soil is a highly acidic pegassy clay. It contains a considerable amount of organic matter, possessing a wide carbon/nitrogen ratio. The amount of soluble salts present is low. The theoretical lime requirement is high.

The monthly rainfall during the growth period and the mean monthly rainfall for the area for the preceding years are compared in Table XXXVII.

TABLE XXXVII.

Month.	Rainfall, inches. 1906-1932	1931-1932 Excess or deficit.
February	5.34	— 0.36
March	6.85	— 5.19
April	6.81	— 4.34
May	13.52	+ 5.72
June	14.07	+ 7.11
July	11.97	+11.20
August	8.42	— 1.40
September	3.86	+ 3.45
October	3.70	+ 2.78
November	5.99	— 3.18
December	11.85	— 0.85
January	8.43	+ 0.78
February	5.34	— 2.10
March	6.85	— 1.15
April	6.81	+ 8.62
Total	119.81	+21.09

The results of the plant cane crop appear in Table XXXVIII, and are also represented graphically in Figure XXVI.

TABLE XXXVIII.

Fertiliser.	Rate per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent.
Sulphate of Ammonia	6 cwt.	27.84	4.05	109.3
" " "	4 cwt.	25.02	3.64	98.2
" " "	2 cwt.	24.76	3.60	97.2
Control	nil	22.47	3.27	88.2
Means	—	25.47	3.70	100.0
S. E. of means	—	0.659	0.096	2.59
Significant Differences	—	1.90	0.276	7.48

"Z" value obtained for effect of nitrogen on weight of cane.....=1.206
"Z" value required for P=0.01.....=0.7086

The dressings of nitrogen have therefore had a very definite effect upon the yield of cane.

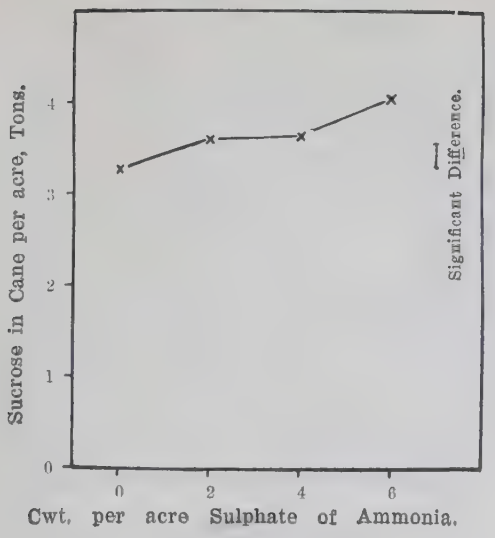

FIG. XXVI.

Effect of Sulphate of Ammonia on Pegassy Clay (Plant Canes).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results shows that the various treatments of sulphate of ammonia have had no effect upon the sucrose content of the cane. Values for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (14.54%).

Further statistical analysis shows that the varied dressings of sulphate of ammonia have had no effect upon the juice purity nor upon the glucose ratio.

A definite interaction is noted between the graded dressings of sulphate of ammonia and of ground limestone in connection with the yield of cane. The figures for the yields of sucrose per acre appear in Table XXXIX and are depicted in Figure XXVII.

TABLE XXXIX.

Sulphate of Ammonia Cwt. per acre.	Ground Limestone, Tons per Acre.			
	0	1	4	8
0	2.91	3.24	3.52	3.37
2	2.96	3.27	3.83	4.31
4	2.95	3.33	3.97	4.26
6	3.36	4.36	4.29	4.14

S. E. of mean.....0.192
Significant Difference.....0.604
"Z" value obtained for interaction of limestone and sulphate of ammonia=0.356
"Z" value required for P=0.05.....=0.340

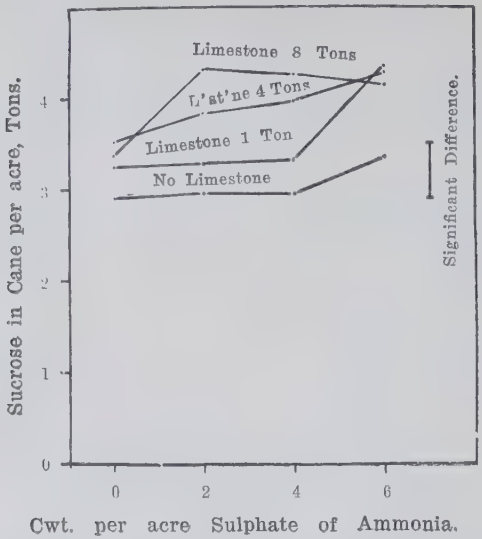

FIG. XXVII.

Interaction of Sulphate of Ammonia and Ground Limestone on Pegassy Clay (Plant Canes).

The general mean analytical figures for the experiment are :—

Purity	91.14
Glucose Ratio	6.77
Percentage of Sucrose in the Cane	14.54

Conclusions : Under the prevailing conditions of the experiment :—

(a) Dressings of sulphate of ammonia produce increases in the plant cane crop on pegassy clay soil ;

(b) The yield obtained with a dressing of 4 cwt. per acre of sulphate of ammonia does not differ significantly from that obtained with a dressing of 2 cwt. per acre of sulphate of ammonia ;

(c) A dressing of 6 cwt. per acre of sulphate of ammonia gives a significantly superior yield to that obtained with dressings of 2 cwt. or 4 cwt. per acre ;

(d) The varied dressings of sulphate of ammonia have had no definite effect in the plant cane crop upon (i) the sucrose content of the cane, (ii) the juice purity, and (iii) the glucose ratio ;

(e) There is a definite interaction between the graded dressings of sulphate of ammonia and the graded dressings of ground limestone in regard to their effect upon the yield of cane.

(B) Experiments with Lime-Bearing Materials.

(B1) *Ground Limestone in the Row on Flooded Front Land Clay (Pln. Port Mourant).*

This experiment involves graded dressings of ground limestone and graded dressings of sulphate of ammonia in all combinations. The effects of the applications of sulphate of ammonia have been considered under section (A) Exp. (1).

The nature of the experiment, the calendar of agricultural operations and the rainfall for the experimental period have already been described.

Samples of the ground limestone used in this experiment had the following mechanical composition :

Passing a sieve having 10 meshes to the inch.....99.55%
Passing a sieve having 100 meshes to the inch.....60.65%

The limestone was in a satisfactory state of sub-division.

The plant cane results appear in Table XL.

Table XL.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per Cent.
Ground limestone	6	53.95	6.86	106.5
" "	3	51.05	6.50	100.8
" "	1	48.70	6.20	96.2
Control	0	48.91	6.23	96.7
Means	...	50.65	6.45	100.0
S.E. of means	...	2.117	0.269	4.17
Significant Differences	...	6.10	0.779	12.04

"Z" value obtained for effect of limestone dressings on yield of cane=0.1425
"Z" value required for P=0.05.....=0.5362

Samples of cane from each plot were ground and examined at the Experiment Station. Statistical analysis shows that dressings of ground limestone have not affected the values for the percentage of sucrose in the cane. The figures for the tons of cane per acre have consequently been multiplied by the general mean value for the percentage sucrose in cane (12.74%) in order to obtain the values for the sucrose per acre. Further statistical analysis indicates that the dressings of ground limestone are without effect upon the juice purity.

Conclusions : Under the existing experimental conditions:—

Dressings of ground limestone have *no* definite effect in the plant cane crop, on the yield of cane, the percentage of sucrose in the cane nor on the juice purity.

(B2) Ground Limestone and Agricultural Slaked Limestone in the Row on Flooded Front Land Clay (Pln. Leonora).

This experiment involves graded dressings of ground limestone and graded dressings of agricultural slaked lime.

Composite samples of the topsoil and subsoil of the experimental area were examined in the laboratory ; the results appear in Appendix II.

The topsoil is a highly acidic heavy silt, and overlies a highly acidic clay. The organic matter content of the topsoil is below the average ; its carbon/nitrogen ratio is narrow. The lime requirement and the content of soluble salts are typical of this class of soil. The subsoil possesses more soluble salts and a higher magnesia/lime ratio than the soils of this class in the vicinity.

The monthly rainfall during the experimental period is compared in Table XLI with the mean monthly rainfall for the preceding years.

TABLE XLI.

Month.	Rainfall, inches. 1906-1931	1931-1932 Excess or deficit.
June	12.60	−1.91
July	10.89	+2.33
August	7.41	−2.38
September	3.07	−0.23
October	3.30	+3.32
November	6.38	−3.83
December	11.77	−2.98
January	8.64	+0.62
February	4.60	−1.20
March	5.54	+0 73
April	5.19	+8.42
May	13.16	+0.69
Total	92.55	+3.58

Samples of the ground limestone and agricultural slaked lime used in the experiment were examined in the laboratory. The results appear in Tables XLII. and XLIII.

TABLE XLII.

Composition of Ground Limestone.

Degree of sub-division.	
Passing through a sieve having 10 meshes to the inch	93.2%
Passing through a sieve having 100 meshes to the inch	31.8%
Composition.	
Lime (CaO)	55.44%
Magnesia (MgO)	0.14%
Moisture at 105°C.	nil.

TABLE XLIII.

Composition of Agricultural Slaked Lime.

Composition.	
Lime (CaO)	56.28%
Magnesia (MgO)	0.72%
Moisture at 105°C.	18.6%

The ground limestone was in a poor state of sub-division, and is likely to prove less effective than the average sample of ground limestone.

The sample of slaked lime is one of low lime content, it is, however, similar in this respect to other samples of agricultural slaked lime that have been examined in the laboratory.

The results of the plant cane crop appear in Table XLIV.

TABLE XLIV.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	5	42.68	5.54	101.65
„ „	2	41.06	5.33	97.80
„ „	1	40.93	5.31	97.43
Slaked lime	5	42.28	5.48	100.55
„ „	2	40.85	5.30	97.25
„ „	1	44.10	5.72	104.95
Control	Nil	41.98	5.44	99.82
Means	...	41.98	5.45	100.0
S.E. of means	...	1.459	0.189	3.48
Significant Differences	...	4.28	0.555	10.2

The "Z" value obtained for the effect of treatment on yields of cane is a negative value. The effect of the various dressings is, therefore, *not* significant. Further statistical examination shows that neither quality nor quantity of the lime-bearing materials have a definite effect on the yield of cane.

It was not found possible to examine samples of cane from the individual plots of this experiment. One bulked sample of cane was ground and analysed at Sophia Experiment Station. The results are :—

Purity	84.3
Glucose Ratio	12.84
Percentage of Sucrose in the cane	12.97

Conclusions : Under the conditions of the experiment :—

(a) Dressings of lime-bearing materials up to 5 tons per acre have *no* effect upon the yield of cane ;

(b) *No* distinction can be drawn between the efficiency of ground limestone and agricultural slaked lime.

(B3) Ground Limestone Broadcasted on Unflooded Front Land Clay (Sophia Experiment Station).

This experiment contained graded dressings of ground limestone and one treatment of ground rock phosphate. The results of the plant cane harvest were reported in the *Agricultural Journal*, IV, 2, pp. 64—68. The figures for the first ratoon crop are here considered.

Figures for the analysis of composite samples of the topsoil and subsoil of the area of which the experimental site is part, were given in the original report. Subsequently the control plots of the experimental site have been sampled and analysed. The results are in general agreement with those obtained for the larger area. The values for the theoretical lime requirement of the topsoil and subsoil of the experimental area are respectively 3.9 tons and 1.2 tons of ground limestone per acre.

A sample of the ground limestone employed in this experiment had the following mechanical composition :—

Passing a sieve having 10 meshes to the inch 98.8%
Passing a sieve having 100 meshes to the inch 57.8%

The limestone was in a satisfactory state of sub-division.

The monthly rainfall for the experimental period is compared in Table XLV. with the mean monthly rainfall of the area for preceding years.

TABLE XLV.

Month.	Rainfall, inches. 1921-1931	1931-1932 Excess or deficit.
June	14.65	— 2.06
July	11.14	+ 1.62
August	8.36	— 1.39
September	3.07	— 0.01
October	3.92	+ 2.76
November	6.25	— 4.38
December	14.25	— 5.26
January	7.11	+ 1.81
February	3.75	— 2.63
March	3.73	+ 2.84
April	4.12	+11.19
May	11.67	+ 1.66
June	14.65	+ 0.29
July	11.14	— 4.04
August	8.36	— 1.52
Total	126.17	+ 0.88

The yields obtained with the first ratoon crop are shown in Table XLVI. and are graphically represented in Figure XXVIII.

TABLE XLVI.

Fertiliser.	Rate, Ton per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	12	10.93	1.63	110.9
„ „	9	10.77	1.60	108.8
„ „	6	9.95	1.48	100.7
„ „	3	9.64	1.44	98.0
Ground limestone Ground rock phosphate	9 0,5	9.83	1.46	99.3
Control	0	7.96	1.19	81.0
Means	—	9.85	1.47	100.0
S. E. of means	—	0.424	0.063	4.29
Significant Differences	—	1.34	0.200	13.6

"Z" value obtained for the effect of limestone dressings on the yield of cane..... = 0.9159

"Z" value required for P = 0.01 ..... = 0,7058

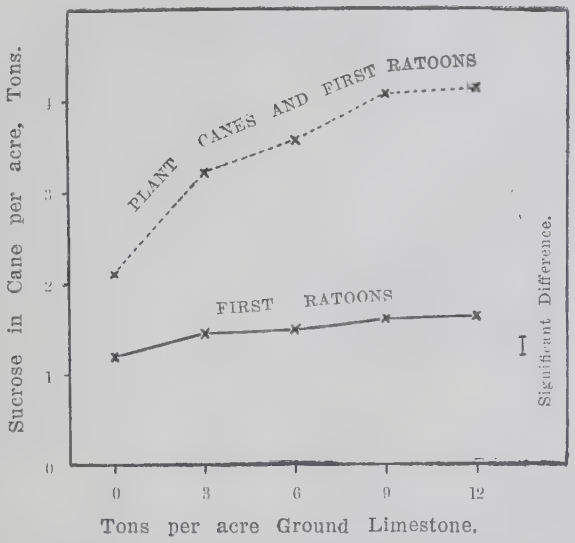

FIG. XXVIII.

Effect of Ground Limestone on Unflooded Front Land Fine Silt (Plant Canes and First Ratoons).

The yields obtained for the plant cane crop and the first ratoon crop are combined and presented in Table XLVII.

TABLE XLVII.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.
Ground limestone	12	27.43	4.13
„ „	9	27.32	4.08
„ „	6	24.16	3.57
„ „	3	22.03	3.22
Ground limestone Ground rock phosphate	9 0.5	25.13	3.76
Control	0	14.39	2.11
Means	—	23.41	3.48

It was not found possible to examine samples of cane from individual plots of the first ratoon crop. Six composite samples, each representative of one of the treatments, have been analysed. In order to obtain values for the tons of sucrose per acre, the figures for the tons of cane per acre have been multiplied by the mean value for the percentage of sucrose in cane (14.90%).

The general mean analytical figures for the experiment are :—

Purity	90.05
Glucose Ratio	3.44
Percentage of Sucrose in the Cane	14.90

The general yield from the experiment has been disappointing. This was ascribed in the original report to the lack of flood-fallowing or mechanical tillage, to the small applications of sulphate of ammonia, and to unfavourable weather conditions. A further reason is the variety of cane used. Field trials by the Agronomist indicate that B. H. 10 (12) is not suited to the majority of British Guiana cane soils. The experimental area has been replanted to Diamond 10 variety.

Conclusions: Under the prevailing conditions of the experiment, the following conclusions may be drawn as to the effect of dressings of ground limestone to plant canes on the yield of first ratoons :—

(a) The residual effects of dressings of ground limestone are significant;

(b) The residual effects of the varied dressings of ground limestone are *not* significantly different.

It is unfortunate that B. H. 10 (12) was selected as an indicator in this experiment. Forthcoming results with Diamond 10 variety should prove of interest.

Inspection of the total yields appearing in Table XLVII, suggests that an application of 3 tons per acre of ground limestone in this area will result in an increased yield of 1.11 tons of sucrose per acre in the plant canes and first ratoons. An application at the rate of 9 tons per acre appears to give an increase in the two crops of 1.97 ton sucrose per acre.

(B4) Broadcasted Dressings of Ground Limestone on Unflooded Front Land Clay (Sophia Experiment Station).

Half of the plots in this experiment received broadcasted dressings of ground limestone at the rate of 10 tons to the acre. The trial includes combinations of other manures. The effects of varied dressings of sulphate of ammonia have already been considered (Section A, Exp. 4).

The nature of the experiment, the character of the soil, the calendar of agricultural operations and the rainfall data for the experimental period, have already been described.

Samples of the ground limestone employed had the following mechanical composition :

Passing a sieve having 10 meshes to the inch.....99.55%
Passing a sieve having 100 meshes to the inch.....60.65%

The limestone was in a satisfactory state of subdivision.

The results of the plant cane crop appear in Table XLVIII and in Figure XXIX.

TABLE XLVIII.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of Mean.
Ground limestone	10	17.92	2.21	111.0
Control	nil	14.35	1.77	88.9
Means	...	16.14	1.99	100.0
S.E. of means	...	0.405	0.05	2.51
Significant Differences	...	1.17	0.144	7.25

"Z" value obtained for effect of ground limestone on yield of cane.....=1.8276
"Z" value required for P=0.01.....=0.9784

The effect of a dressing of ground limestone on the plant cane yield is therefore highly significant.

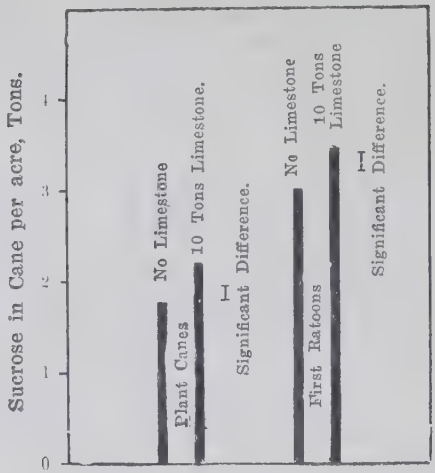

FIG. XXIX.

Effect of Ground Limestone on Unflooded Front Land Clay (Plant Canes and First Ratoons).

Samples of cane from each plot were ground and analysed at the Sophia Experiment Station. Statistical analysis of the results indicates that dressings of ground limestone have had no measurable effect upon the percentage of sucrose in the cane or upon the glucose ratio. The dressings, however, have had a definite effect upon the juice purity. The results appear in Table XLIX.

TABLE XLIX.

Fertiliser.	Rate, Tons per acre.	Juice Purity.	Per cent. of mean.
Ground limestone	10	82.94	99.1
Control	nil	84.38	100.9
Means	...	83.66	100.0
S.E. of means	...	0.258	0.31
Significant Differences	...	0.745	0.89

"Z" value obtained for effect of ground limestone on juice purity.....=1.3735
"Z" value required for P=0.01.....=0.9784

The effect of a dressing of ground limestone on the juice purity of the plant-canes is therefore highly significant.

An obscure interaction between limestone, potash and phosphate is noted in connection with the glucose ratio. This effect has not been repeated in the first ratoon crop.

The general mean analytical figures for the experiment have been given in a previous section.

Conclusions (Plant Cane Crop): Under the prevailing conditions of the experiment :—

(a) A broadcasted dressing of ground limestone at the rate of 10 tons per acre gives a definite increase in the yield of cane ;

(b) A broadcasted dressing of ground limestone at the rate of 10 tons to the acre has an adverse effect upon the juice purity.

The results of the first ratoon crop appear in Table L and in Figure XXIX.

TABLE L.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	10	23.36	3.47	107.1
Control	nil	20.34	3.02	92.9
Means	—	21.82	3.24	100.0
S.E. of means	—	0.463	0.07	2.12
Significant Differences		1.337	0.20	6.12

"Z" value obtained for effect of ground limestone on yield of cane.....=1.5273
"Z" value required for P=0.01.....=0.9784

The residual effect of ground limestone, applied to the plant canes, is highly significant in the first ratoon crop. The interaction between ground limestone and sulphate of ammonia has been considered in a preceding section.

Samples of cane from each plot were ground and analysed at the Experiment Station. Statistical analysis shows that the dressing of limestone is without effect upon the percentage of sucrose in the cane. The figures for the yield of cane have consequently been multiplied by the mean percentage of sucrose in cane (14.85%) in order to obtain values for the yield of sucrose per acre.

Further statistical analysis indicates that dressings of ground limestone have had an effect on the juice purity, and upon the glucose ratio. The results appear in Table LI.

TABLE LI.

Fertiliser.	Rate, Tons per acre.	Juice Purity		Glucose Ratio	
		Actual.	Per cent of mean.	Actual.	Per cent. of mean.
Ground limestone	10	86.98	99.4	10.01	104.1
Nil	...	87.96	100.6	9.23	95.9
Means	...	87.47	100.0	9.62	100.0
S.E. of means	...	0.184	0.210	0.266	2.77
Significant Differences		0.530	0.606	0.760	7.90

"Z" value obtained for effect of ground limestone on juice purity.....=1.3304
"Z" value obtained for effect of ground limestone on glucose ratio.....=0.7164
"Z" value required for P=0.01.....=0.9784
"Z" value required for P=0.05.....=0.6933

Conclusions (First Ratoon Crop): Under the conditions of the experiment:—

(a) Dressings of ground limestone broadcasted at planting exert a definite effect upon the yield of the first ratoons;

(b) Dressings of ground limestone, applied to the plant canes, reduce the juice purity and increase the glucose ratio of the first ratoon crop.

(*B5*) *Ground Limestone in the Row on Pegassy Clay (Pln. Farm).*

This experiment involves graded dressings of ground limestone, sulphate of ammonia, and certain dressings of sulphate of potash. The effects of the various applications of sulphate of ammonia, and the interaction of ground limestone and sulphate of ammonia, have already been considered (Section A, Exp. 5).

The nature of the experiment, the character of the soil, the calendar of agricultural operations and the rainfall data have already been described.

Samples of the ground limestone used in this trial had the following mechanical composition:—

Passing a sieve having 10 meshes to the inch.....94.5%
Passing a sieve having 100 meshes to the inch.....36.9%

The ground limestone was in a poor state of subdivision, and is likely to prove less effective than the average sample of ground limestone.

The results of the plant cane crop appear in Table LII, and are graphically represented in Figure XXX.

TABLE LII.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	8	27.71	4.03	108.8
" "	4	26.91	3.91	105.7
" "	1	24.48	3.56	96.1
Control	nil	20.99	3.05	82.4
Means	...	25.47	3.70	100.0
S.E. of means	...	0.659	0.096	2.59
Significant Differences	...	1.90	0.276	7.48

"Z" value obtained for effect of ground limestone on yield of cane.....=1.6090
"Z" value required for P=0.01.....=0.7086

The effect of application of ground limestone is therefore highly significant.

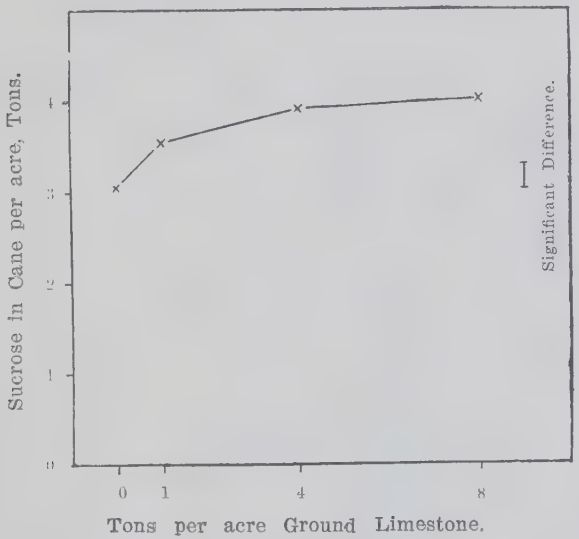

FIG. XXX.
Effect of Ground Limestone on Pegassy Clay (Plant Canes).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis indicates that dressings of ground limestone are without effect upon the percentage of sucrose in the cane, the juice purity and the glucose ratio. The figures for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in the cane (14.54%).

An interaction between the dressings of ground limestone and those of sulphate of ammonia in connection with the yield of cane has already been noted and the figures appear in Table XXXIX. The effects of varied dressings of ground limestone at different levels of sulphate of ammonia are depicted in Figure XXXI.

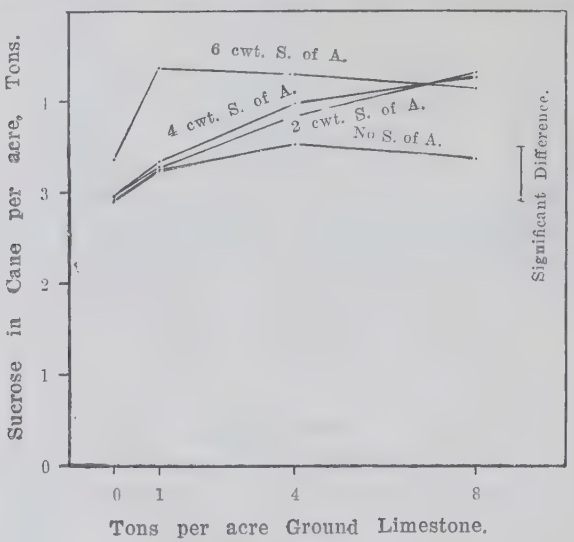

FIG. XXXI.

Interaction of Ground Limestone and Sulphate of Ammonia on Pegassy Clay (Plant Canes).

In connection with the glucose ratio, an obscure interaction is noted between the dressings of ground limestone, sulphate of ammonia and sulphate of potash.

Conclusions: Under the prevailing experimental conditions :—

(a) Dressings of ground limestone produce increases in the plant cane crop on pegassy clay soil ;

(b) The yield obtained with a dressing of ground limestone at the rate of 1 ton per acre is significantly superior to that obtained without dressings of ground limestone ;

(c) A dressing of 4 tons per acre of ground limestone gives a significantly superior yield to that obtained with a dressing at the rate of 1 ton per acre ;

(d) The yield obtained with a dressing of ground limestone at the rate of 8 tons per acre does not differ significantly from that obtained with dressings at the rate of 4 tons per acre ;

(e) Varied dressings of ground limestone are without effect on (i) the sucrose content of the cane, (ii) the juice purity and (iii) the glucose ratio ;

(f) There is a definite interaction between the graded dressings of ground limestone and the graded dressings of sulphate of ammonia in regard to their effect upon the yield of cane.

(*B6*) *Ground Limestone and Agricultural Slaked Lime in the Row on Pegassy Clay* (*Pln. Uitvlugt*).

This experiment involves graded dressings of ground limestone and graded dressings of agricultural slaked lime.

Composite samples of the topsoil and subsoil of the experimental area were examined in the laboratory ; the results appear in Appendix II.

The topsoil is a highly acidic pegassy clay overlying a highly acidic clay subsoil. The organic matter content is lower, and the carbon : nitrogen ratio is wider than the average for this class of soil. The content of soluble salts is low, and the lime requirement is high.

The monthly rainfall for the experimental period is compared in Table LIII with the mean monthly rainfall for the area for preceding years.

TABLE LIII.

Month.	Rainfall, inches.	
	1916-1931	1931-1932 Excess or deficit.
May	13.61	— 0.14
June	13.97	+ 0.19
July	12.10	+ 2.80
August	7.98	— 2.17
September	3.64	+ 1.64
October	3.99	+ 3.24
November	7.70	— 3.71
December	13.72	— 2.24
January	8.74	+ 1.61
February	4.11	+ 0.20
March	4.38	+ 4.86
April	4.91	+15.95
May	13.61	+ 1.76
June	13.97	+ 1.55
July	12.10	— 2.22
August	7.98	— 1.53
Total	146.51	+ 21.79

Samples of the ground limestone and slaked lime used in the experiment were examined in the laboratory. The results appear in Tables LIV and LV.

TABLE LIV.

Composition of Ground Limestone.

Degree of subdivision.	
Passing through a sieve having 10 meshes to the inch ...	... 97.0%
Passing through a sieve having 100 meshes to the inch ...	... 39.0%
Composition.	
Lime (CaO)	... 54.60%
Magnesia (MgO)	... 0.36%
Moisture at 105° C.	... 0.40%

TABLE LV.

Composition of Agricultural Slaked Lime.

Composition.	
Lime (CaO)	... 59.90%
Magnesia (MgO)	... 1.19%
Moisture at 105° C.	... 6.60%

The degree of subdivision of the ground limestone was slightly below the average. The chemical composition was satisfactory.

The sample of slaked lime is one of low lime content. It is, however, similar in this respect to other samples of this product examined in the laboratory. It contains more magnesia than does the sample of ground limestone.

The results of the plant cane crop are presented in Table LVI.

TABLE LVI.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	5	29.59	4.56	105.1
„ „	2	28.91	4.46	102.8
„ „	1	27.70	4.27	98.4
Slaked lime	5	28.61	4.41	101.6
„ „	2	28.44	4.38	101.0
„ „	1	28.58	4.40	101.4
Control	nil	25.35	3.90	89.9
Means	...	28.18	4.34	100.0
S.E. of means	...	0.707	0.109	2.51
Significant Differences	...	2.07	0.32	7.35

"Z" value obtained for effect of treatment on yield of cane ..... =0.6632

"Z" value required for P=0.01 ..... =0.5687

Further statistical examination of the results indicates that the source of lime has had no effect upon the yield, but that the quantity used has a definite effect. The figures for the effect of quantity appear in Table LVII, and are depicted in Figure XXXII.

TABLE LVII.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Lime-bearing material	5	29.10	4.48	103.3
,, ,, ,,	2	28.67	4.41	101.9
,, ,, ,,	1	28.14	4.33	99.9
Control	nil	25.35	3.90	89.9
Means	...	28.18	4.34	100.0
S.E. of means	...	0.50	0.077	1.78
Significant Differences	...	1.44	0.22	5.11

"Z" value obtained for effect of quantity upon yield of cane ... =0.9626

"Z" value required for P=0.01 ... ... =0.7086

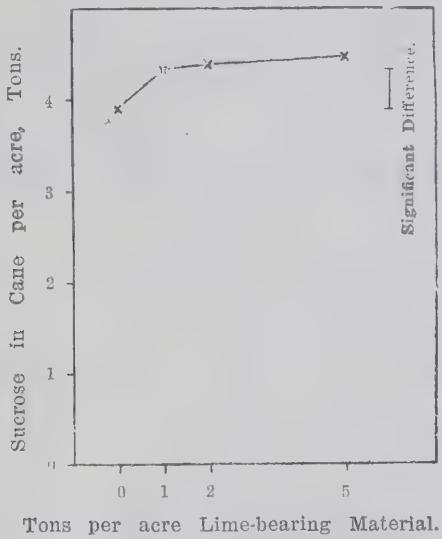

FIG. XXXII.

Effect of Lime-bearing Materials on Pegassy Clay (Plant Canes).

It was not found possible to examine samples of cane from each plot of this experiment. Eight composite samples were ground and analysed at Sophia. The general mean analytical figures are :—

Purity	92.1
Glucose Ratio	5.24
Percentage of Sucrose in the Cane	15.40

The figures for the yield of cane have been multiplied by the mean figure for the percentage of sucrose in cane (15.40%) in order to obtain figures for the yield of sucrose per acre.

Conclusions: Under the conditions of the experiment :—

(a) Dressings of lime-bearing materials (ground limestone or slaked lime,) exert a significant effect upon the yield of cane ;

(b) Dressings of lime-bearing materials at the rate of one ton per acre give a definite increase in yield ;

(c) Dressings of lime-bearing materials at the rate of two tons and five tons per acre give no definite increase in yield over that obtained with a dressing at the rate of one ton per acre ;

(d) No difference can be noted between the effects of ground limestone and slaked lime.

(C) Experiments with Phosphatic Manures.

(C1) *Ground Rock Phosphate on Unflooded Front Land Clay (Sophia Experiment Station).*

This experiment, which involves graded dressings of ground limestone, has already been considered (Section B, Exp. 3). There were included two treatments of ground limestone at the rate of 9 tons per acre, the one without further addition, the other combined with a dressing of ground rock phosphate at the rate of 0.5 ton per acre.

The character and conditions of the experiment have already been described. It will be noted that the topsoil and subsoil of the experimental area contain 0.0058% and 0.0041% available phosphate (P_2O_5 dissolved by 1% citric acid solution on continuous shaking for five hours).

A sample of the ground rock phosphate employed had the following composition :—

Passing a sieve having 10 meshes to the inch..... 100%
Passing a sieve having 100 meshes to the inch..... 80.7%
Phosphoric anhydride..... 36.6%

The yields of sucrose per acre for the two treatments for the plant cane crop and for the first ratoon crop appear in Table LVIII.

Table LVIII.

Fertiliser.	Sucrose, Tons per acre.	
	Plants.	1st Ratoons.
Limestone 9 tons per acre and Rock Phosphate 0.5 ton per acre	2.28	1.46
Limestone 9 tons per acre	2.43	1.60
Significant Differences	0.30	0.20

Conclusions: Under the conditions of the experiment:—

A dressing of ground rock phosphate applied to the plant cane at the rate of 0.5 ton per acre has *no* significant effect upon the yields of cane in the plant cane crop, nor in the first ratoon crop.

(C2) Superphosphate and Ground Rock Phosphate on Unflooded Front Land Clay (Sophia Experiment Station).

This experiment, which involves graded dressings of sulphate of ammonia and dressings of ground limestone, superphosphate, ground rock phosphate and sulphate of potash, has already been considered (Section A, Exp. 4 and Section B, Exp. 4).

The plots receiving phosphatic manures were divided into half plots. One half plot, chosen at random, of each plot, was dressed with superphosphate of lime while the other half plot received an equivalent dressing of ground rock phosphate. The phosphatic dressings were at the rate of 150 lb. P_2O_5 per acre.

The character and conditions of the experiment have already been described. It will be noted that the topsoil and subsoil of the experimental area contain 0.0082% and 0.0048% available phosphate (P_2O_5 dissolved by 1% citric acid solution on five hours continuous shaking).

The effects of phosphatic treatments on the yield of sucrose per acre for the plant cane crop and for the first ratoon crop are shown in Table LIX.

TABLE LIX.

Fertiliser.	Sucrose, Tons per acre.	
	Plants.	1st. Ratoons.
Applications of phosphates at the rate of 150 lb. P_2O_5 per acre	2.00	3.20
No Phosphate	1.98	3.28
S. E. of means	0.05	0.07
Significant Differences	0.144	0.20

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results shows that phosphatic manures, applied to the plant canes, have no effect on the yield of cane, the precentage of sucrose in the cane, the juice purity or on the glucose ratio, of either the plant canes or the first ratoon crop.

No interactions between the phosphatic manures and the other fertilisers are noted.

Further statistical analysis of the results has been made in order to compare the effects of dressings of superphosphate with those obtained by an equivalent dressing of ground rock phosphate. The results for the plant cane crop appear in Table LX.

TABLE LX.

Difference in favour of superphosphate 0.18 ton sucrose per acre.

Value of "t".....2.310
„ „ "n".....60
"P" is less than 0.05 but greater than.....0.02

This result must be judged significant and indicates that, under the conditions of this experiment, superphosphate is more effective in the plant cane crop than an equivalent dressing of ground rock phosphate.

The results obtained with the first ratoon crop are shown in Table LXI.

TABLE LXI.

Difference in favour of superphosphate 0.09 ton sucrose per acre.

Value of "t".....1.052
"n".....63
"P".....0.30

No difference is noted in the first ratoon crop between the residual effect of a dressing of superphosphate and that of an equivalent dressing of ground rock phosphate.

Conclusions: Under the conditions of the experiments :—

(a) Dressings of phosphatic manures have *no* effect upon the yield of cane, the percentage of sucrose in the cane, the juice purity nor the glucose ratio of the plant cane crop ;

(b) No interaction between phosphatic manures and other fertilisers is noted in the plant cane crop ;

(c) Superphosphate appears to be slightly superior to ground rock phosphate as regards the yield of plant cane ;

(d) Dressings of phosphatic manures, applied at planting, have no residual effect upon the yields of cane, the percentage of sucrose in the cane, the juice purity or on the glucose ratio of the first ratoon crop ;

(e) No interaction between phosphatic manures and other fertilisers is noted in the first ratoon crop ;

(f) No difference between the residual effects of superphosphate and ground rock phosphate is noted in the first ratoon crop.

(D) EXPERIMENTS WITH POTASSIC MANURES.

(*D1*) *Sulphate of Potash on Unflooded Front Land Clay* (*Sophia Experiment Station*).

This experiment, which involves graded dressings of sulphate of ammonia and dressings of ground limestone, superphosphate, ground rock phosphate and sulphate of potash, has already been considered (Section A, Exp. 4, Section B, Exp. 4, and Section C, Exp. 2).

The character and conditions of the experiment have already been described. It will be noted that the topsoil and subsoil of the experimental area contain respectively 0.20 mgm. eqs. and 0.10 mgm. eqs. of exchangeable potash per 100 gms. soil.

The effects of potassic dressings on the yield of sucrose per acre for the plant cane and for the first ratoon crop are shown in Table LXII.

TABLE LXII.

Fertiliser.	Sucrose, Tons per acre.	
	Plants.	1st Ratoons.
Sulphate of potash at the rate of 150 lbs. K_2O/acre	1.99	3.20
No Sulphate of potash	1.99	3.28
S. E. of means	0.05	0.07
Significant Differences	0.144	0.20

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results shows that dressings of sulphate of potash have had no definite effect upon the yield of cane, the sucrose content of the cane, the juice purity, or the glucose ratio, of either the plant cane or the first ratoon crop. No interactions between the potassic manure and the other fertilisers are noted.

Conclusions: Under the conditions of the experiment :—

(a) A dressing of sulphate of potash has *no* direct effect in the plant cane, nor residual effect in the first ratoon crop upon the yield of cane, the sucrose content of the cane, the juice purity, or the glucose ratio ;

(b) No interactions are noted between the potassic and other manures, either in the plant cane crop, or in the first ratoon crop.

(*D2*) *Sulphate of Potash on Pegassy Clay* (*Pln. Diamond*).

This experiment, which involves graded dressings of sulphate of ammonia and of ground limestone, has been already described (Section A. Exp. 5 and Section B. Exp. 5).

The trial included a dressing of sulphate of potash at the rate of 2 cwt. per acre. Lack of space in the field prevented the inclusion of potash treatments in every possible combination. These treatments were therefore confined to a single level of nitrogen application. The experiment consequently gives information regarding the effect of an application of sulphate of potash in combination with a small dressing of sulphate of ammonia at different levels of limestone application.

The character and conditions of the experiment have already been described. It should be noted that the topsoil of the experimental area contains 0.0034% available potash (Soluble in 1% citric acid solution), and 0.17 mgm. eqs. per cent exchangeable potash ; the corresponding figures for the subsoil are 0.0053% and 0.12 mgm. eqs. per cent.

The effects of the potassic dressing on the yield of sucrose per acre are shown in Table LXIII. and are represented graphically in Figure XXXIII.

TABLE LXIII.

Fertiliser.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
2 cwt./acre sulphate of ammonia and 2 cwt./acre sulphate of potash	27.25	3.96	104.8
2 cwt./acre sulphate of ammonia	24.76	3.60	95.2
Means	26.00	3.78	100.0
S. E. of means	0.659	0.096	2.54
Significant Differences	1.90	0.276	7.30

"Z" value obtained for the effect of sulphate of potash on yield of cane.....=0.9833

"Z" value required for P = 0.01.....=0.9784

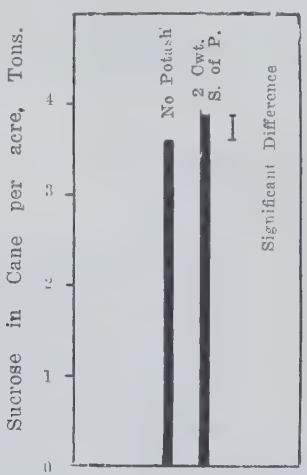

FIG. XXXIII.

Effect of Sulphate of Potash on Pegassy Clay (Plant Canes).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis indicates that the dressing of sulphate of potash has had no effect upon the sucrose content of the cane, the juice purity, nor the glucose ratio. The only interaction noted is between varied dressings of ground limestone with a single dressing of sulphate of ammonia, in the presence or absence of sulphate of potash. This interaction is only obtained for the glucose ratio.

Conclusions : Under the conditions of the experiment :—

(a) A dressing of sulphate of potash gives, in the presence of a single dressing of sulphate of ammonia, a definite increase in yield ;

(b) A dressing of sulphate of potash has no definite effect on the sucrose content of the cane, the juice purity, or on the glucose ratio ;

(c) An obscure interaction is noted in connection with the glucose ratio.

DISCUSSION.

It is held in some quarters, that further manurial experimentation is unnecessary on the sugar lands of the Colony. It is often suggested also that the trials carried out by the late Sir John Harrison in the early part of this century still form a sound basis for a manurial programme and that any deficiencies in his findings may be supplied by the single comparison of adjacent fields, the one treated, the other untreated. Many reasons can be advanced to oppose such a view.

It is twenty-one years since Harrison summarised his experience in *The West Indian Bulletin* (Vol. XIII., 1913). His experiments were carried out solely on the front land soil, which at that time possessed a well marked alkaline reaction. It has been shown elsewhere (*Rept. Chem. Division, Dept. Agriculture, B.G., 1931*) that the clay soils of the Colony have changed considerably in recent years. Further, Harrison's experiments never, at any time, considered the pegasse soil type, of which some twenty-five per cent. of the Colony's cane lands are comprised. Flood fallowing has lately become an established procedure. Its effect on manurial practice was not explored by Harrison.

In the present position of the sugar industry an alteration in fertiliser practice which furnishes an increase of fifteen per cent. in the crop may be of great importance. It is impossible to detect with certainty such small differences by the single comparison of two halves of a field or of two adjacent fields. There is little doubt, therefore, that fertiliser practice could, with profit, receive more attention than it does at present.

Broadly speaking, there are four soil conditions in British Guiana which require fertiliser investigations. They are :—

(1) Flood fallowed front land soil, (2) unflooded front land soil (rapidly diminishing in area), (3) unflooded pegasse soil and (4) flooded pegasse soil.

It would be unwise to seek to apply the results of only one experiment under one of these conditions to the whole of the Colony. It is, however, interesting to compare the varied effects of the different manures that have so far been investigated since our experiments were inaugurated in 1930.

SULPHATE OF AMMONIA.

In the one experiment with graded dressings of sulphate of ammonia on *flood fallowed front land clay* (Section A, Exp. 1) it appears that the plant cane yields obtained with dressings of 4. cwt. and 6 cwt. per acre of sulphate of ammonia do not differ significantly from those obtained with a dressing at the rate of 2 cwt. per acre. The experiment at Pln. Uitvlugt with second ratoons on *flooded clay* soil (*Agr. Journal B. G.*, IV, p. 10.) suggests however, that heavier dressings of sulphate of ammonia may be employed with ratoons.

The experiments with graded dressings of sulphate of ammonia on *unflooded front land* soil, (Section A, Exps. 2, 3 and 4), suggest that the yields obtained with dressings of sulphate of ammonia at the rate of 3.4 cwt. per acre are definitely higher than those obtained with a dressing at the rate of 1.7 cwt. per acre. A drop in sucrose quality may be expected in the ratoons with the higher dressings of sulphate of ammonia.

In the one experiment with graded dressings of sulphate of ammonia on *pegassy clay* soil, (Section A, Exp. 5) it appears that the plant cane yields obtained with dressings of sulphate of ammonia at the rate of 6 cwt. per acre are significantly higher than those obtained with dressings at the rate of 2 cwt. or 4 cwt. per acre.

In two of the experiments involving graded dressings of sulphate of ammonia and ground limestone, (Section A. Exps. 4 and 5) an interaction between the two fertilisers is apparent. It seems that, in the presence of the higher dressings of ground limestone, the heavier dressings of sulphate of ammonia are less effective.

It is recognised that the results of single experiments cannot form the basis of the Colony's manurial programme: nevertheless the results here reported clearly support the contention that the varied soil types of the cane lands possess differing nitrogen requirements.

LIME-BEARING MATERIALS.

It has long been a debatable point in this Colony as to the best source of lime for agricultural purposes. The material usually employed is slaked lime of poor quality. There are several considerations which favour the use of ground limestone (*Ministry of Agr. & Fisheries, Bull.* 35; *Agr. Jour. B. G.*, Vol. II. p. 61). On the other hand no sound theoretical or practical reason has yet been advanced in favour of the use of slaked lime on the cane soils of British Guiana.

The plant cane results of two experiments designed to compare the effects of ground limestone and slaked lime, have been reported (Section B, Exps. 2 and 6). In neither experiment could any differences between the two sources of lime be detected. In both experiments, the ground limestone was cheaper and less expensive to apply.

In the two experiments with graded dressings of lime-bearing materials applied in the row on *flood fallowed front land soil*, (Section B, Exps. 1 and 2) it appears that no definite increases are obtained in the plant cane crop.

In the two experiments with broadcasted dressings of ground limestone on *unflooded front land soil*, (Section B, Exps. 3 and 4) it appears that significant increases are obtained in the plant cane crop, and that definite residual effects are noted in the first ratoon crop. There is some evidence that heavy dressings of ground limestone have an *adverse* effect on the juice purity of the plant cane, and on the juice purity and glucose ratio of first ratoons.

In the two experiments with graded dressings of lime-bearing materials, applied in the row on *pegassy clay soil* (Section B, Exps. 5 and 6) it appears that dressings at the rate of one ton per acre give definite increases in yield in the plant cane crop, but that heavier dressings do not give further increases in the plant cane crop. As in the case of the experiments with sulphate of ammonia, the results here presented support the contention that the varied soil types of the Colony's cane lands possess different requirements of lime.

PHOSPHATIC MANURES.

In the two experiments with dressings of ground rock phosphate on *unflooded front land soil*, (Section C, Exps. 1 and 2) no increased yields were obtained. The soil of the one experimental area would have been classed by Harrison as of doubtful phosphate status, while that of the other area would have been considered to contain a sufficiency of available phosphate.

In the latter experiment, there is some indication that superphosphate is more effective than ground rock phosphate. On the other hand, the yield and quality of the crop are unaffected by dressings of phosphatic manures, and this is in accord with Harrison's findings that soils containing more than 0.007 per cent. of phosphoric anhydride soluble in one per cent citric acid solution will not, as a rule, respond to manurings with phosphates.

POTASSIC MANURES.

In the one experiment with dressings of sulphate of potash on *unflooded front land soil* (Section D, Exp. 1) no increased yields were obtained in the plant cane crop, nor were residual effects noted in the first ratoon crop.

In the one experiment with dressings of sulphate of potash on a *pegassy clay soil* (Section D, Exp. 2) a definite increase in yield was obtained.

SUMMARY.

It will be realised that it is extremely difficult, at this stage of our investigations, to make definite pronouncements as to the best fertiliser practice. Further, the correct rate of application depends upon the price of sugar. In boom years heavier dressings may be desirable. In many of our experiments only the plant cane crop has been reaped, while in most cases the influential soil factor, whether it be flooded clay or unflooded pegasse, is represented by only one experiment. Arrangements have recently been made to replicate experiments with sulphate of ammonia under varied soil conditions.

The present position with regard to fertiliser practice, which may of course require some modification when further results are available, is outlined below, in case planters would care to apply the findings to a few fields on an estate scale.

Sulphate of Ammonia.

For plant canes on *flooded front land soil*, 2 cwt. per acre appears to be the optimum dressing. The rate of application to the ratoons might be increased and $3\frac{1}{2}$ cwt. per acre may be the best dressing.

For plant canes on *unflooded front land soil*, $3\frac{1}{2}$ cwt. to 5 cwt. per acre appears to be the optimum dressing, while for the first ratoons a dressing at the rate of $3\frac{1}{2}$ cwt. per acre appears to be more suitable.

For plant canes on *pegassy soils* a dressing of sulphate of ammonia at the rate of 6 cwt. per acre appears to be the optimum.

Lime-Bearing Materials.

The penetration of lime into the heavy Colony soils is a slow process and the results of experiments carried over a number of crops are required before definite pronouncements can be made.

On *flooded front land soil* dressings of ground limestone or slaked lime in the row at rates up to 6 tons per acre have no effect on the plant cane crop.

On *unflooded front land soil* broadcasted dressings of ground limestone at the rate of from 3 to 10 tons per acre give definite increases in yield in the plant cane and first ratoon crops.

On *pegasse soil*, dressings of ground limestone or slaked lime in the row at rates up to 8 tons per acre have a marked effect upon the yield of plant cane. The cost of the 1 ton application is probably recovered in the plant cane crop.

Two experiments were designed to compare the effectiveness of ground limestone and slaked lime. In neither experiment could any distinction be drawn regarding the two sources of lime as evidenced in the plant cane crop. Several theoretical and practical reasons have been advanced in favour of the use of ground limestone. On the other hand no valid reason has yet been put forward to support the use of slaked lime on the Colony's cane lands.

Our experiences with the application of phosphatic and potassic manures to the Colony's cane soils do not permit, at present, the statement of definite opinions. There are indications that dressings of superphosphate of lime are superior to equivalent applications of ground rock phosphate.

DRAINAGE TRIALS.[1]

In *The Agricultural Journal of British Guiana*, IV, pp. 33-39, an account is given of a preliminary trial with covered bamboo drains in a markedly acid heavy silt overlying a markedly acid clay. The idea of using the drains there described originated with Mr. Charles Cameron, the Field Manager of the Sophia Sugar Experiment Station, who had first used them to offset unsatisfactory conditions brought on in a field by the suppression of open drains and the substitution therefor of another type of bamboo drain (plaited matting) with which Whittles experimented. In the preliminary trial referred to, very definite increases in plant cane yields were obtained from the bamboo-drained plots, as compared with the control, and the results were so encouraging that a more detailed trial was started in Field 9 West of the Sophia Sugar Experiment Station.

Results obtained from the first and second ratoons of the preliminary trial (Field 4 West, Sophia) and the plant canes and first ratoons of the later experiment are here presented. In each instance the variety used was D.625.

RAINFALL AND DRAINAGE.

The rainfall recorded during the experimental period and the monthly average for the Station are compared in Table LXIV.

[1] A portion of the data in this section has been incorporated in a paper submitted by one of us (C.H.B.W.) to the Imperial College of Tropical Agriculture (Trinidad) in partial fulfilment of the requirements for an Associateship.

TABLE LXIV. RAINFALL AT THE SOPHIA SUGAR EXPERIMENT STATION.

Month.	Rainfall 1930-1932, inches.	Average Rainfall 1921-1931, inches.
September	0.99	3.07
October	1.37	3.92
November	1.60	6.25
December	8.94	14.25
January	2.13	7.11
February	3.58	3.75
March	2.17	3.73
April	1.23	4.12
May	11.66	11.67
June	12.59	14.65
July	12.76	11.14
August	6.97	8.36
September	3.06	3.07
October	6.68	3.92
November	1.87	6.25
December	8.99	14.25
January	8.92	7.11
February	1.12	3.75
March	6.57	3.73
April	15.31	4.12
May	13.33	11.67
June	14.94	14.65
July	7.10	11.14
August	6.84	8.36
September	.45	3.07
October	3.89	3.92
November	.09	6.25
Totals	165.15	197.28

It will be seen that while the total rainfall was well below the average, that of the very wet months (May-July) was about normal, with an abnormally wet April in 1932.

The water-table level has been frequently measured in the adjacent Fields 4 West and 13 West. The average figures are :—

	Field 4 West. Inches.	Field 13 West. Inches.
Mean depth of Water-Table	35.6	22.7
Maximum depth of Water-Table	42	44
Minimum " " " "	27.5	12
Difference	14.5	32

Numerous observations point to the fact that the lateral movement of soil water is very slow ; the middle portions of beds often remain water-logged for some time after heavy rains, although the open drains, 18 ft. away on either side may be almost empty.

THE EXPERIMENTS.

The treatments tested were :—

(a) *Control* : The usual 37 ft. wide bed ;

(b) *Pierced Bamboos* : The usual 37 ft. wide bed with bamboos laid in ditches at right angles to the field drains and opening into them ; ditches 2 ft. deep and 1 ft. wide ; bamboos 4 abreast, cut into 6 ft. lengths, placed in the bottom of each ditch and covered, first with a layer of cane trash and then with soil ; the nodes at the septa of the bamboos pierced with an iron rod before laying ;

(c) *Unpierced Bamboos* : Same as "b", but septa at bamboo nodes left unpierced ;

(d) *Bed "Drills", 2 ft. deep* : Ditches 2 ft. deep and 1 ft. wide, similar to those used for the bamboos, left open throughout the experiment ;

(e) *Bed "Drills" 1 ft. deep* : Ditches similar to above, but only 1 ft. deep.

Whenever "b", "c", "d", or "e" were used, the ditches were put down between every other row of cane, *i.e.*, on alternate inter-rows. Cane being grown in rows 5 ft. apart at the Sophia Station, the bamboo drains or "bed drills", as the case may be, were thus placed every 10 feet.

In field 4 West, "a", "b" and "c" only were tried, there being four replicates of each. In Field 9 West, there were two Latin Squares, each with four replicates, Latin Square I containing treatments "a", "b", "c", and "e" and Latin Square II treatments "a", "b", "c" and "d".

"Bed Drills", as they are called locally, are gaining in popularity in the Colony and find special favour in the County of Berbice. It is not usual to make them much over 1 ft. deep. A field with a deep bed drill at every other inter-row is not unlike a field laid out in the Porto Rican *gran banco* method, save that the drains which separate local beds are deeper and the beds themselves have a camber.

The costs of the various treatments, per acre, over and above the usual routine operations, were :

	$
Control	—
Pierced Bamboos	48.00
Unpierced „	40.00
Bed Drills, 2 ft. deep	15.00
Bed Drills, 1 ft. „	7.50

Against this must be offset the saving on the forking of every alternate inter-row, roughly $5.00 per acre.

THE RESULTS.

Field 4 West. The topsoil of this field is a markedly acid heavy silt (Index of Texture 41, exchange reaction pH 4.8, lime requirement 6 tons per acre); its subsoil is a markedly acid clay (Index of Texture 48, exchange reaction pH 4.8, lime requirement 4.3 tons per acre).

The experiment was cut as plants on September 24th, 1930. The first ratoons were reaped on November 5th, 1931, and the following mean results were obtained from four plots (0.13 acre each) of each treatment :—

TABLE LXV. BAMBOO DRAINAGE. FIRST RATOONS OF PRELIMINARY TRIAL.

Treatment.	Cane per Acre, Tons.	Sucrose in cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane, per Acre Tons.
Pierced Bamboos	22.33	11.29	11.92	78.7	2.52
Unpierced „	22.39	11.16	13.52	78.0	2.49
Control	17.54	10.87	14.48	77.9	1.91

The second ratoons were reaped on November 24, 1932, and gave the following results :—

TABLE LXVI. BAMBOO DRAINAGE. SECOND RATOONS OF PRELIMINARY TRIAL.

Treatment.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane, per Acre, Tons.
Unpierced Bamboos	28.30	13.58	13.35	86.1	3.84
Pierced „	24.78	13.84	15.92	85.2	3.42
Control	23.39	13.63	13.85	86.2	3.20

It was not possible to determine sucrose in cane on the plant cane samples and so the yield was presented as sucrose per acre based only on the analysis of the juice from laboratory mills expressing 55 per cent. of the weight of the cane as juice. It is interesting to note the total increment, so far, due to the bamboo drains ;

TABLE LXVII. COMBINED RESULTS OF PLANT CANES, FIRST AND SECOND RATOONS.

TREATMENT.	Plant Canes.	First Ratoons.	Second Ratoons.	Total for 3 Crops.
	Sucrose per Acre (Juice only), Tons.	Sucrose in Cane, per Acre, Tons.	Sucrose in Cane, per Acre, Tons.	Sucrose per Acre, Tons.
Unpierced Bamboos	2.65	2.49	3.84	8.98
Pierced „	2.40	2.52	3.42	8.34
Control „	1.30	1.91	3.20	6.41

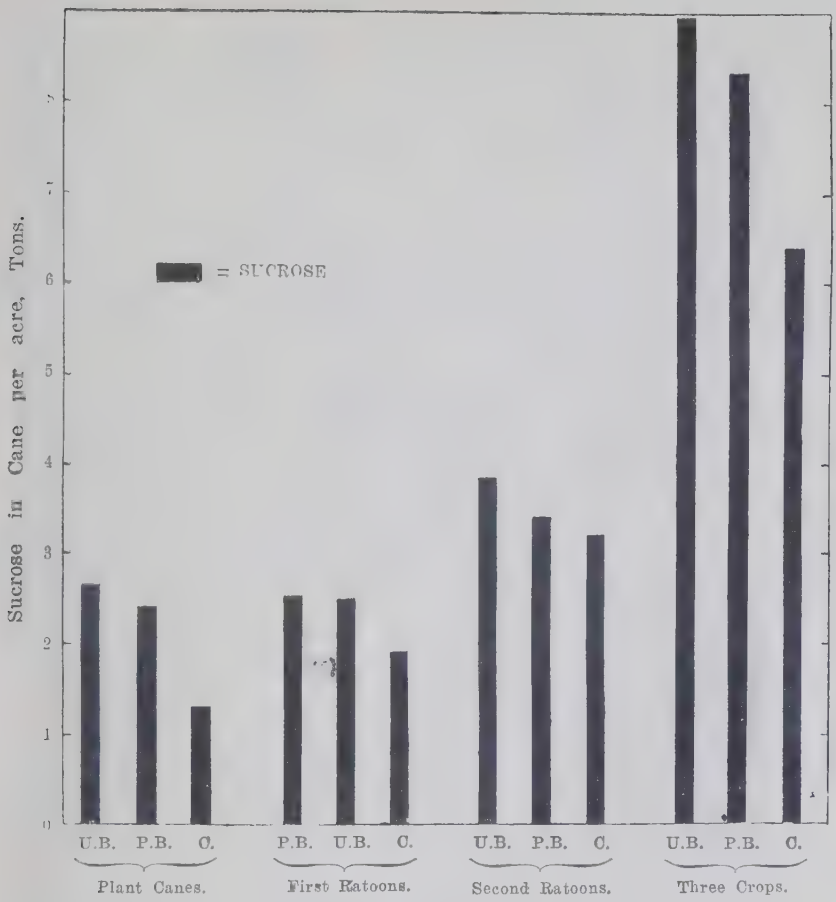

FIG. XXXIV.

Yields of Sucrose from Field 4W., Sophia.

Soil samples were withdrawn from the various plots of the experiment both after the harvesting of the plant canes and after the reaping of the first ratoons. It was thought that some correlation between the yields and the soluble salt and chloride content of the soils might be disclosed and that the plot treatments might have affected the concentration of these constituents. It soon became apparent that these concentrations varied with the fluctuations in water table level and that fictitious correlations were obtained.

Numerous analyses of the subsoil water obtained in the vicinity of the experiment have yielded the following mean results :—

	Parts per million.
Chlorine (Cl)	3964
Sulphate (SO_4)	650
Bicarbonate (HCO_3)	625
Carbonate (CO_3)	Nil
Calcium (Ca)	135
Magnesium (Mg)	410
Sodium (Na)	2110
Total solids	8438

The immediate proximity of subsoil water of such high salt content is likely to affect markedly the salinity of the soil. It seems probable that more interesting results would be obtained by periodic measurement of the movement of the water table in the various plots.

The mean values for the soluble salt and chloride contents, the normal pH and the exchange pH are given in Table LXVIII.

TABLE LXVIII. BAMBOO DRAINAGE. SALT AND CHLORIDE CONTENT AND pH OF SOIL.

	Pierced Bamboos.	Unpierced Bamboos.	Control.
Plant Cane:			
% Soluble salts			
Topsoil	0.045	0.039	0.048
Subsoil	0.139	0.143	0.140
% Chlorides			
Topsoil	0.0192	0.0191	0.0265
Subsoil	0.0582	0.0661	0.0637
pH normal			
Topsoil	4.77	4.95	4.97
Subsoil	5.22	5.48	5.95
pH exchange			
Topsoil	3.85	4.03	4.00
Subsoil	4.37	4.62	5.07
First Ratoon Cane:			
% Soluble salts			
Topsoil	0.070	0.071	0.082
Subsoil	0.169	0.152	0.176
% Chlorides			
Topsoil	0.0112	0.0115	0.0139
Subsoil	0.0470	0.0432	0.0499
pH normal			
Topsoil	4.86	4.93	4.90
Subsoil	5.08	5.24	5.44
pH exchange			
Topsoil	3.80	3.88	3.84
Subsoil	4.25	4.37	4.57

Statistical analysis indicates that the various treatments, have, with one exception, had no measurable effect upon the concentration of soluble salts or of chlorides. The salt content of the subsoil of the plots underdrained with unpierced bamboos was definitely lower than that of the control plots in the samples withdrawn after the reaping of the first ratoons. It is of interest to notice that the ratio of chloride to soluble salts is considerably lower in the second than in the first year.

In addition to the examination of individual samples, composites representing the various treatments after the plant cane crop, were studied as to their content of water soluble and exchangeable bases. The results appear in Table LXIX.

TABLE LXIX. WATER SOLUBLE AND EXCHANGEABLE BASES IN THE SOIL.

TREATMENT	MILLIGRAMME EQUIVALENTS PER 100 GRAMMES SOIL.							
	Topsoil				Subsoil			
	Lime	Magnesia	Soda	$\frac{MgO}{CaO}$	Lime	Magnesia	Soda	$\frac{MgO}{CaO}$
Pierced Bamboos	5.04	11.00	1.23	2.18	3.92	12.90	4.63	3.29
Unpierced „	4.96	10.85	1.44	2.19	3.76	13.30	4.58	3.54
Control	4.96	11.60	1.79	2.34	4.08	14.20	4.64	3.48

Underdrainage appears to have reduced slightly the soda content of the topsoil and the subsoil content of magnesia.

Field 9 West. The topsoil of this field is a slightly acidic heavy silt (Index of Texture 42, exchange reaction pH 5.00, lime requirement 4.2 tons), its subsoil a neutral clay (Index of Texture 45, exchange reaction pH 6.51, lime requirement 2.2 tons).

This experiment was planted on September 18, 1930, and first reaped on November 30, 1931. As in field 4 West, the main commercial cane of the Colony, D. 625, was used. The area of each plot reaped was 0.056 acre.

There appears to have been little difference between the effects of bed drills 2 ft. deep and those 1 ft. deep and it has been decided to regard the treatments as identical and combine the results of the two Latin Squares in the statistical analysis. Table LXX. shows the results from the Plant Canes :—

TABLE LXX. BAMBOO DRAINAGE. PLANT CANE RESULTS. FIELD 9 WEST, SOPHIA.

	Control.	Drills.	Pierced Bamboos.	Unpierced Bamboos.	Mean.	Standard Error.	Sig. Diff.
Sucrose per acre, Tons :	2.59	2.77	3.04	3.15	2.89	0.0651	0.195
Per Cent :	89.62	96.19	105.19	109.00	100.00	2.25	6.75
Z value found :						1.0209	
Z „ „ „ P = 0.01						0.8919	

The yields from the bamboo drained plots were definitely better than the yields from the Controls and the Drills. There is no measurable difference between the yields from Unpierced and Pierced Bamboo plots.

The Drills gave a suggestive but not significant increase over the Controls. The various treatments had no significant effect upon the per cent. sucrose in cane.

The first ratoons were reaped on November 25th, 1932, and yielded the following results :—

TABLE LXXI.

BAMBOO DRAINAGE. FIRST RATOON RESULTS, FIELD 9 WEST, SOPHIA.

	Controls.	Drills.	Pierced Bamboos.	Unpierced Bamboos.	Mean.
Sucrose per acre, Tons :	3.40	3.64	3.76	3.80	3.65
Per Cent :	93.2	99.8	103.0	104.1	100.0

Statistical analysis of the results indicates that the effect of treatment is not significant for the " Z " obtained for effect of treatment was 0.4425 whereas the " Z " required for P = 0.05 is 0.6250. The trend of the yields is the same as in the plant canes and is very suggestive.

Treatment had no effect upon the per cent. sucrose in cane nor upon the glucose ratio.

Adding together the yields for the two crops (Plant Canes and First Ratoons), the following figures are obtained for Latin Square I :

Latin Square I.

Unpierced Bamboos	7.06	Tons	Sucrose	in	Cane	per	acre
Pierced Bamboos	7.04	"	"	"	"	"	"
Bed Drill, 1 foot	6.77	"	"	"	"	"	"
Control	6.06	"	"	"	"	"	"

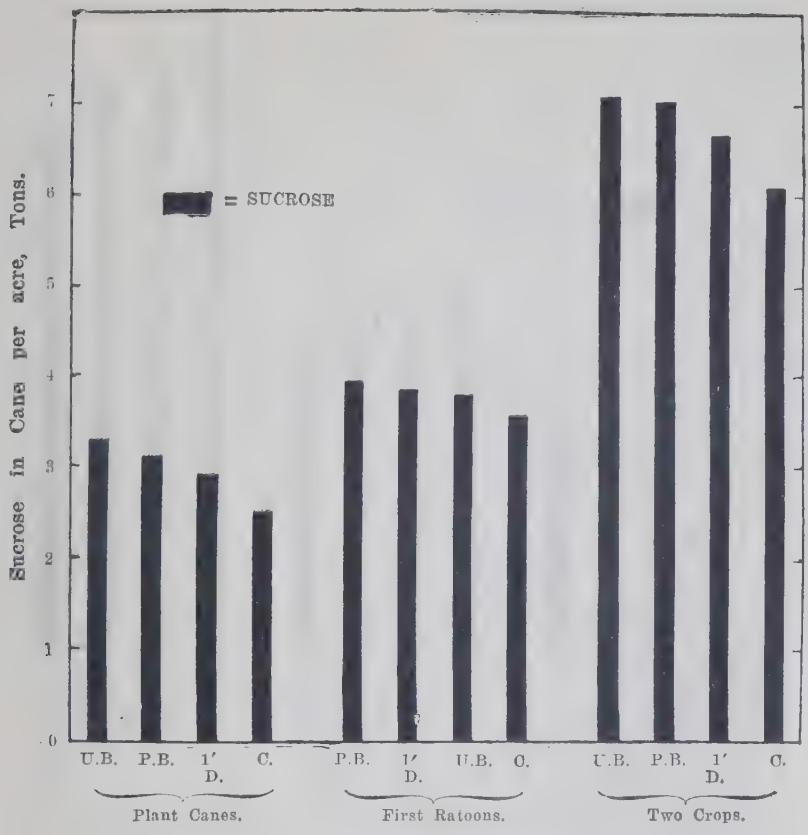

FIG. XXXV.

Yields of Sucrose from Field 9W,, Sophia (Latin Square I).

The combined results from both crops for Latin Square II are :—

Latin Square II.

Unpierced Bamboos	6.92	Tons	Sucrose	in	Cane	per	acre.
Pierced Bamboos	6.70	”	”	”	”	”	”
Bed Drill, 2 feet	6.06	”	”	”	”	”	”
Control	5.72	”	”	”	”	”	”

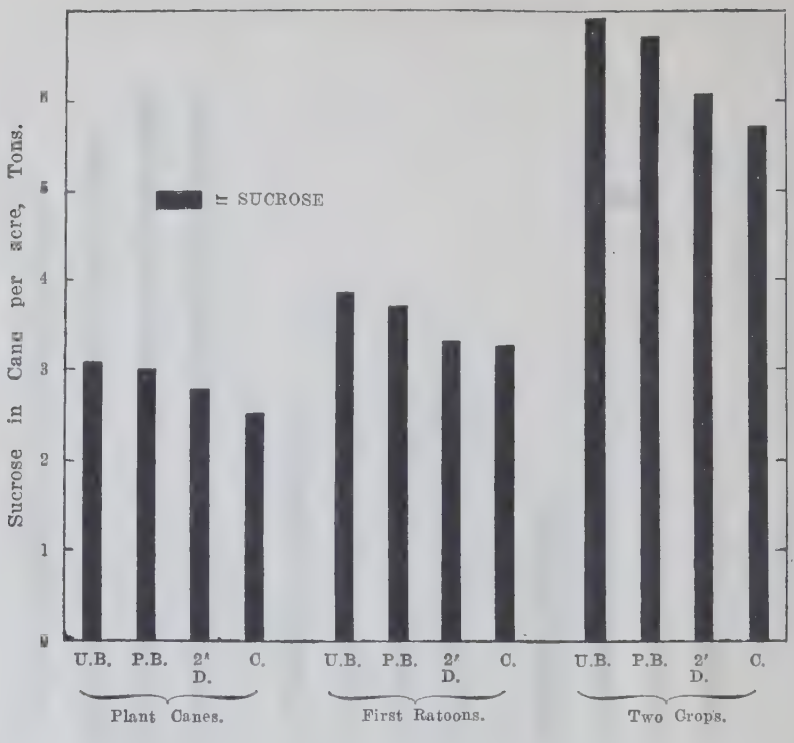

FIG. XXXVI.

Yields of Sucrose from Field 9W., Sophia (Latin Square II).

Composite soil samples were withdrawn from each plot after the reaping of the Plant Canes and again after the reaping of the First Ratoons. The results are presented in Table LXXII.

TABLE LXXII.

BAMBOO DRAINAGE. RESULTS OF SOIL EXAMINATION.

	Topsoil.						Subsoil.					
	Plant Canes			First Ratoons			Plant Canes			First Ratoons		
	Salts	pH		Salts	pH		Salts	pH		Salts	pH	
	%	Normal	Exchange	%	Normal	Exchange	%	Normal	Exchange	%	Normal	Exchange
Latin Square I.												
Unpierced Bamboos ...	0.045	5.42	4.33	0.048	5.98	4.68	0.157	6.60	5.84	0.114	7.48	6.25
Pierced Bamboos ...	0.050	5.44	4.37	0.059	6.06	4.83	0.147	6.60	5.71	0.131	7.48	6.27
Bed Drill, 1 ft. ...	0.049	5.40	4.28	0.053	5.78	4.40	0.132	6.64	5.72	0.119	7.27	6.04
Control	0.045	5.41	4.37	0.053	5.98	4.72	0.132	6.68	5.83	0.114	7.64	6.34
Latin Square II.												
Unpierced Bamboos ...	0.068	5.49	4.53	0.047	5.84	4.44	0.162	6.59	5.78	0.115	6.93	6.16
Pierced Bamboos ...	0.097	5.28	4.48	0.049	5.81	4.69	0.268	6.56	5.87	0.111	7.45	6.24
Bed Drill, 2 ft. ...	0.162	5.20	4.50	0.058	5.92	4.66	0.180	6.54	5.73	0.122	7.09	5.81
Control	0.116	5.33	4.52	0.050	5.94	4.59	0.181	6.54	5.73	0.114	7.55	6.22

Statistical examination of these results indicates that the salt contents of neither the topsoil nor the subsoil, at the times of sampling, were measurably affected by the various treatments. As far as the Plant Canes are concerned, the total variance of the salt content of the soils was large in spite of the fact that carefully collected samples were withdrawn from each plot, and in general no definite connection between the salt content of the soil and the various treatments was noted. The soil samples examined after the First Ratoon crop were collected about one week after reaping. The rainfall for the preceding three months was low. There is a general drop in soil salinity, more especially in Square 2, but these changes probably depend on fluctuations in the water-table level. It is suggestive that in both cases the salinity of the topsoil of unpierced bamboo areas is lower than that of the other treatments.

It will be noticed that there is a general increase in the soil reactions of the area after the reaping of the First Ratoons as compared with the figures obtained after the reaping of the Plant Canes. No relationship has been established between reaction and treatment.

The salt content of the mill juice of the First Ratoons was determined by conductivity methods, several of the samples being ashed in order to obtain a factor for converting the figures to ash per cent. juice. The results appear in Table LXXIII.

TABLE LXXIII.

BAMBOO DRAINAGE. PER CENT. ASH CONTENT OF FIRST RATOON JUICE.

	Ash % Juice.	*Per Cent. of Mean.*
Unpierced Bamboos	0.407	98.8
Pierced Bamboos	0.414	100.5
Bed Drills	0.403	97.8
Control	0.422	102.4
Mean	0.412	100.0
Standard Error of Mean	0.0093	2.26
Significant Difference	0.0284	6.89
"Z" value found	0.2264	
"Z" value required for P = 0.05	0.6250	

The treatments have had no measurable effect upon the ash content of the juice of the First Ratoon crop.

Attempts were made to establish correlations between the various measurements. A significant correlation between the salt content of the juice and the yield of cane ($r = -0.5278$ ($P = 0.01$)) was demonstrated. It is surprising that no connection was noted between the juice purity and the salt content of the juice.

SUMMARY.

An attempt has been made to measure the effect of covered bamboo drains in heavy, low-lying, saline clays, typical of considerable areas on the coastal belt of British Guiana.

Plant Cane, First and Second Ratoon results from a preliminary trial are discussed. The results obtained all point to marked increases in the yield of cane as a result of bamboo drainage.

Plant Cane and First Ratoon results from a more detailed experiment are also presented. Definite and statistically significant increases from the plant canes and suggestive, though not significant, increases from the first ratoons have been demonstrated.

Open drains, similar to those in which the bamboos were placed, also gave increased yields, but the increments were not as marked as those obtained from bamboo drains.

No correlation was found between the yield of the individual plots and the salt content or reaction of the soil just after harvest.

The economy of the use of bamboo drains depends, to a large extent, upon the durability of the drains. These experiments, carried through one or two planting cycles, should satisfactorily settle the point.

APPENDIX I.

Calendar of Agricultural Operations on Manurial Trial Areas.

Experiment No.	Page of Bulletin	Estate	Field	Variety	System of replication	Size of plots, acres	Date of Planting	Date of Applying limestone and/or slaked lime	Date of Applying phosphate	Date of Applying potash	Date of Applying sulphate of ammonia	Date of Reaping
A I B I	43 61	Port Mourant	6 A.	D. 625	4 randomised blocks of 16 treatments	0.051	5.XII.30	27.XI.30	20.XII.30[1]		28.I.31	1.III.32[5]
A II	46	Sophia Expt. Station	17 E.	B. H. 10 (12)	A five by five Latin square	0.056	13.X.29				2.IV.31[6]	23.II.31[5] 25.II.32[6]
A III	49	Blairmont	47 B.L.	D. 625	A seven by seven Latin square	0.051	22.I.30		19.V.31[1, 6]		19.V.31[3, 6] 4, 6 13.VI.31	24.IV.31[5] 8.IV.32[6]
A IV B IV C II, D I	52 67 77-78	Sophia Expt. Station	5, 7, & 8 W.	D. 625	4 randomised blocks of 32 treatments	0.050	.V.30	9.IV.30[5]	1 or 2, 5 30.VI.30	14.VII.30[5]	14.VII.30[5] 24.X.31[6]	3.X.31[5] 6.X.32[6]
A V B V D II	57 70 79	Farm	86 G. D.	D. 625 & D. 118	6 randomised blocks of 20 treatments	0.051	7.II.31	20.I.31		12.III.31	12.III.31	14.IV.32[5]
B II	62	Leonora	21 G. V.	D. 625	12 randomised blocks of 7 treatments	0.043	5.VI.31	2.IV.31				21.V.32[5]
B III C I	64 76	Sophia Expt. Station	12 W.	B. H. 10 (12)	A six by six Latin square	0.0413	11.II.30	5.II.30	5.II.30[2]		12.III.30[5] 25.VI.31[6]	20.V.31[5] 7.IX.32[6]
B VI	73	Uitvlugt	75 Z.	D. 625 & D. 118	12 randomised blocks of 7 treatments	0.051	30.IV.31	30.IV.31				10.IX.32[5]

[1] Superphosphate [2] Rock phosphate [3] Sulphate of Ammonia and Ferazotine [4] Second dose of Sulphate of Ammonia [5] Plants [6] First Ratoons.

APPENDIX II.

ANALYSES OF COMPOSITE SOIL SAMPLES FROM EXPERIMENTAL AREAS.

The soil of all experimental sites, with the exception of a number of variety trials at Sophia Experiment Station, has been carefully sampled and examined in the laboratory. Composite samples of a number of auger borings of the topsoil (0-1 ft.) and of the subsoil (1-2 ft.) were obtained. The samples were air-dried, mortared and passed through a 1 mm. sieve. The following determinations were made upon the individual samples :—

(1) *Normal Reaction* : The reaction of a 1:4 soil-water mixture of each soil was measured by means of a quinhydrone electrode.

(2) *Exchange Reaction* : The reaction of a suspension of the soil in saturated potassium chloride was measured.

(3) *Comber Colour* : The Comber test was made on each soil as a means of checking the figures for the exchange reaction.

(4) *Moisture at point of stickiness* :[1] The moisture content, stated as a percentage of the oven dry weight, of portions of soil, kneaded with water until the wet mass just failed to stick to the hand, was determined in duplicate on each soil.

(5) *Percentage Sand* :[1] The percentage of particles, having a diameter lying between 1.0 mm. and 0.04 mm., was determined by sedimentation methods (7.5 cms. and 75 seconds).

(6) *Index of Texture* :[1] The index of texture of each soil was calculated in the following manner :—

Index of texture=Moisture at point of stickiness $-\frac{1}{5}$ the per cent. sand.

(7) *Percentage of Soluble Salts* : The electrical conductivity of 1:5 soil-water cultures, after a 20-hour period of extraction, was measured by means of a Wheatstone bridge. The salt content of the soil was calculated by multiplying the specific conductivity of the extract at 28° C by 250 and stating the results as a percentage of the soluble salts in the soil.[2] Experiments with a sample of soil water indicated the suitability of this factor (250) for the purpose.

HARDY, F., Jr. Agri. Scr : (1928) XVIII, pp. 252-256.
JOSEPH, A. F., J. Agri., Sci. (1925) XV. p. 409.

(8) *The Carbon Content* : The carbon content was measured by the wet combustion methods described by Hardy.[3]

(9) *The Nitrogen Content* : The nitrogen content was determined by the Kjeldahl method.

(10) *The Rate of Solution* : The rate of solution was measured by the increase in specific conductivity of 1:5 soil-water mixtures between a 20-hour period of extraction and a 7-day period of extraction.[4]

(11) *The Theoretical Lime Requirement* : The theoretical lime requirement was determined by the method of Hardy and Lewis.[5]

(12) *Readily available Phosphate* : Readily available phosphate was determined by the method described by Truog.[6]

(13) *Available Phosphate and Potash* : Consisted of the amounts of these constituents soluble in a 1% citric acid solution on five hours continuous shaking.

(14) *Exchangeable and Water Soluble Bases* : These bases were removed by leaching twenty-five grams of soil with one litre of semi-normal acetic acid. No attempt was made to remove soluble salts by preliminary washing.

The results obtained are appended ;—

[3] HARDY, F., J. Agri. Sci. (1929) XIX p. 727.
[4] ATKINS, W.R.G., J. Agri. Sci, (1924) XIV p. 198.
[5] HARDY, F., and LEWIS, A.H., J. Agri. Sci. (1929) XIX p. 17.
[6] TRUOG, E., J. Amer. Soc. Agron. (1930) XXII p. 874. (See also C. L. C. Bourne, Agri. Jr., B.G. (1931) IV, p. 91).

Soils of Variety Trial Sites.

Plantation:	Pln. BLAIRMONT				Pln. DIAMOND				Pln. LUSIGNAN				Pln. NON PAREIL		Pln. PORT MOURANT				Pln. UITVLUGT			
Field No.:	11 R.		18 R.		53 G.D.		89 G.D.		19 E.		Mon Repos 22B. E.		14 E.		6 R.		A. 8		W. 1		Z. 10	
Sample:	B. 31	B. 32	B. 48	B. 49	D. 252	D. 253	D. 507	D. 508	D. 260	D. 261	D. 529	D. 530	D. 540	D. 541	B. 29	B. 30	B. 50	B. 51	D. 256	D. 257	D. 503	D. 504
Sampling depth:	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.	0-1 ft.	1-2 ft.
Normal pH	5.52	5.40	4.81	4.62	4.67	4.75	4.6	4.6	5.50	5.37	5.5	6.7	4.88	6.25	5.73	6.63	5.72	5.64	5.30	5.93	5.5	6.3
Exchange pH	4.73	4.83	3.58	3.58	3.73	3.77	3.7	3.8	4.32	4.33	4.4	5.4	3.93	5.36	4.67	6.07	5.05	4.81	4.08	4.88	4.0	4.7
M.P.S.	48.4	48.2	42.7	48.7	48.1	52.3	49.6	49.6	44.4	42.5	41.6	46.7	47.5	52.7	51.3	49.1	49.6	51.6	41.3	45.4	38.7	42.1
% Sand	13.5	8.5	10.2	7.8	1.5	2.2	3.8	4.0	5.5	9.2	2.8	7.0	8.7	4.2	5.9	4.0	44.7	4.5	4.1	2.9	4.4	4.4
Index of texture	46	47	41	47	48	52	49	49	43	41	41	45	46	52	50	48	41	51	41	45	38	41
% Soluble salts	0.116	0.250	0.027	0.034	0.015	0.016	0.018	0.011	0.045	0.184	0.076	0.184	0.046	0.183	0.083	0.199	0.222	0.160	0.034	0.095	0.020	0.039
% Organic matter	1.18	0.79	1.73	1.46	1.87	1.56	3.04	...	1.60	0.85	1.64	...	1.74	0.71	2.12	0.73	0.98	1.84	1.11	0.63	1.14	...
% Nitrogen	0.130	0.114	0.134	0.120	0.160	0.125	0.166	...	0.134	0.085	0.116	...	0.133	0.081	0.180	0.095	0.091	0.151	0.102	0.079	0.099	...
Carbon/nitrogen ratio	5.27	4.05	7.52	7.07	6.79	7.27	10.7	...	6.94	5.81	8.2	...	7.59	5.06	6.85	4.48	6.28	7.08	6.33	4.66	6.70	...
Rate of solution	63	18	34	17	8	0	0	1	205	5	48	27	248	31	123	41	12	34	18	12	9	20
Lime reqt. ton/acre $CaCO_3$	4.9	4.3	10.7	12.4	14.4	14.3	14.3	...	6.7	5.0	5.2	...	7.1	2.3	5.7	1.9	2.1	3.8	6.4	3.5	5.4	...
Avail. P_2O_5 p.p.m. (Truog)	68	28	25	22	46	56	98	34	59	27	45	46	30	33	29	65	40	28	33	27	38	39
Citric P_2O_5 %	0.0067	0.0022	0.0045	0.0034	0.0142	0.0176	0.0228	0.0052	0.0246	0.0040	0.0075	0.0032	0.0086	0.0032	0.0051	0.0034	0.0016	0.0014	0.0082	0.0034	0.0084	0.0031
Citric K_2O %	0.0063	0.0053	0.0047	0.0055	0.0031	0.0032	0.0063	0.0044	0.0068	0.0053	0.0081	0.0048	0.0087	0.0045	0.0068	0.0063	0.0087	0.0073	0.0058	0.0039	0.0041	0.0059
Exch. and water sol. bases mg. eqs/100 gms.																						
Lime	5.10	3.91	6.11	5.15	2.98	3.00	1.40	1.52	6.74	4.07	5.51	4.94	4.65	3.69	5.21	4.46	4.03	3.71	4.98	3.81	5.75	4.80
Magnesia	9.69	9.78	1.99	1.81	1.09	1.45	1.27	2.35	8.51	9.32	12.67	15.75	9.32	11.41	12.96	13.13	9.87	8.78	6.97	10.68	7.79	11.77
Potash	0.29	0.29	0.33	0.19	0.19	0.23	0.29	0.21	0.47	0.41	0.37	0.33	0.21	0.23	0.33	0.35	0.25	0.21	0.27	0.29	0.25	0.21
Soda	1.90	4.32	0.43	0.57	0.31	0.31	0.26	0.37	0.47	3.71	2.18	4.68	0.73	5.53	2.36	4.94	5.92	5.02	0.68	2.73	0.56	1.96
Alumina	...	...	...	...	...	...	14.12	9.41	...	...	0.29	...	...	...	...	...	...	...	...	...	...	...
Ferric Oxide	...	...	...	...	...	...	...	...	...	...	2.41	...	5.43	...	...	...	...	...	...	...	...	...
Magnesia/Lime ratio	1.90	2.50	0.33	0.35	0.36	0.48	0.91	1.55	1.26	2.29	2.30	3.19	2.00	3.09	2.49	2.94	2.45	2.37	1.40	2.80	1.35	2.45

Soils of Manurial Trial Sites.

Plantation:—	Pln. PORT MOURANT		SOPHIA EXPERIMENT STATION				Pln. BLAIRMONT		Pln. FARM		Pln. LEONORA		Pln. UITVLUGT	
Field No.:—	A. 6		5, 7 & 8 W.		12 W.		R.L. 47		G.D. 86		G.V. 21		75 Zeeburg	
Sample No.:—	BCP. III.	BCP. IV.	DCP. XL.	DCP. XLI.	DCP. XXXVIII.	DCP. XXXIX.	BCP. I.	BCP. II.	D. 304	D. 305	D. 509	D. 510	D. 501	D. 502
Normal pH	6.1	6.8	5.4	7.0	5.5	7.2	4.2	4.3	4.2	4.0	5.1	5.2	4.7	4.5
Exchange pH	4.9	5.7	4.2	5.6	4.3	6.0	3.6	3.9	3.9	3.6	3.8	3.9	3.8	3.7
M.P.S.	51.9	51.3	46.8	50.3	40.9	55.1	43.7	40.9	61.8	68.2	41.9	46.6	56.8	54.8
% Sand	2.5	1.5	5.2	4.4	4.9	4.7	9.9	15.3	4.0	1.0	2.8	2.9	6.4	6.9
Index of texture	51	51	46	49	40	54	42	38	61	68	41	46	56	53
% Soluble salts	0.065	0.159	0.052	0.159	0.057	0.133	0.031	0.022	0.038	0.033	0.013	0.028	0.023	0.020
% Organic matter	2.19	...	1.86	...	1.62	...	1.20	...	7.70	...	1.36	...	5.11	...
% Nitrogen	0.179	...	0.144	...	0.132	...	0.100	...	0.329	...	0.130	...	0.205	...
Carbon/nitrogen ratio	7.10	...	7.5	...	7.1	...	6.98	...	13.6	...	6.05	...	14.5	...
Rate of solution	127	54	138	8	84	45	9	0	0	5	20	10	0	11
Lime reqt. ton/acre $CaCO_3$	3.2	1.1	4.3	1.8	3.9	1.2	13.1	...	21.1	19.3	9.3	...	14.5	...
Avail. P_2O_5 p.p.m. (Truog)	24	30	35	49	27	126	25	28	124	30	36	32	42	31
Citric P_2O_5 %	0.0043	0.0059	0.0082	0.0048	0.0058	0.0041	0.0013	0.0022	0.0586	0.0057	0.0175	0.0063	0.0150	0.0067
Citric K_2O %	0.0097	0.0087	0.0097	0.0090	0.0118	0.0083	0.0048	0.0048	0.0034	0.0053	0.0058	0.0053	0.0048	0.0039
Exch. and water sol. bases mg. eqs./100 gms.														
Lime	6.74	4.93	3.98	3.28	5.09	3.92	3.00	3.85	2.61	1.70	5.38	4.59	2.97	2.37
Magnesia	15.57	14.30	10.14	11.47	13.21	12.07	1.81	1.45	1.27	0.91	7.42	10.14	2.53	4.16
Potash	0.29	0.33	0.20	0.10	0.41	0.17	0.12	0.21	0.17	0.12	0.25	0.39	0.25	0.49
Soda	1.80	4.90	1.45	4.52	1.00	3.25	0.26	0.18	0.03	0.04	0.33	0.86	0.03	0.14
Alumina	...	...	...	...	...	...	...	...	41.18	13.53	6.47	2.94	18.8	11.2
Ferric Oxide	...	...	...	...	...	...	...	...	...	...	7.41	3.33	...	...
Magnesia/Lime ratio	2.31	2.90	2.55	3.50	2.60	3.08	0.60	0.38	0.45	0.54	1.38	2.21	0.85	1.77